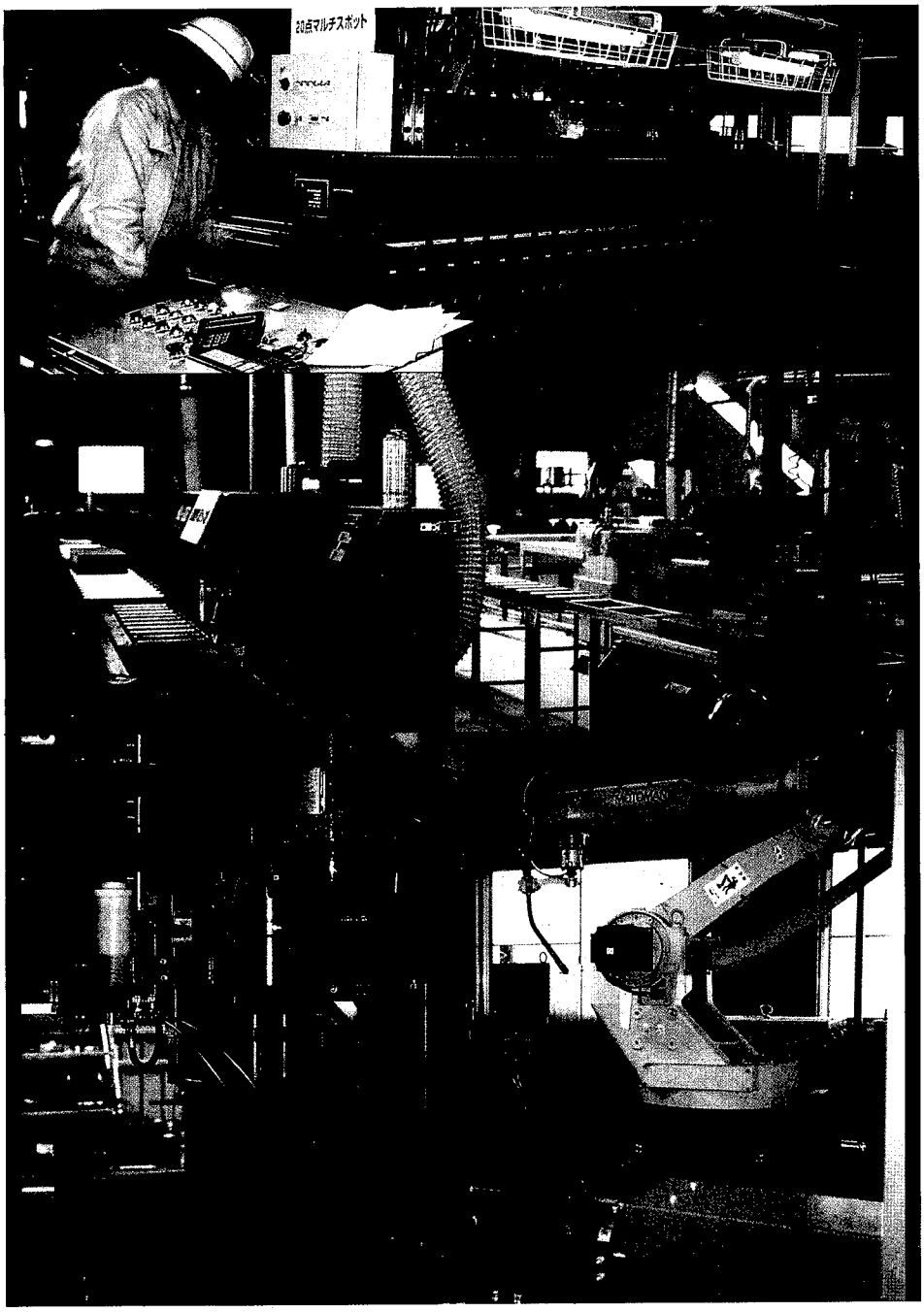
ISSN 0916-7978

PB99-177677

Vol. 25 No.11 February, 1998

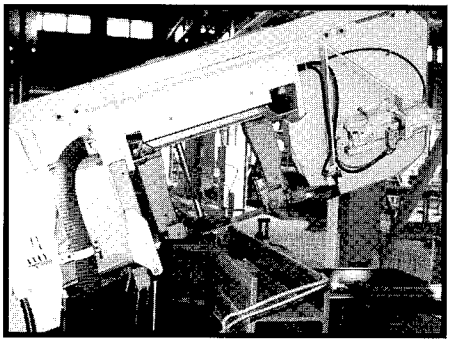
NEW TECHNOLOGY JAPAN



JETRO

NEW TECHNOLOGY JAPAN VOL.25 NO. 11

The aim of our magazine is to promote the international exchange of technology through the introduction of Japanese New Technology.



Publisher:
Japan External Trade Organization, Machinery and Technology Dept.
2-2-5, Toranomon, Minato-ku, Tokyo 105, Japan
Tel: +81-3-3582-4631 Cables: JAPANETRO TOKYO Telex: J24378 Fax: +81-3-3582-7508

Editor:
Three "I" Publications, Ltd.
2-2-5, Uchikanda, Chiyoda-ku, Tokyo 101, Japan
Tel: +81-3-3256-3100 Fax: +81-3-3256-3170

Inquiries Concerning Published Articles

Please place inquiries on published articles directly with the firm concerned. If you require further technological information, please write to the firm concerned or editor.

Comments on the Magazine

Please send your comments concerning editorial matters of the magazine to the publisher or editor.

Cover Photo: Modern Building and Construction Materials Manufacturing Plant for Housing & Civil Works -Ibaraki Works of Ohmori Co., Ltd.-(Story on Pages2-4)

CONTENTS

KEIRIN 00 本印刷物は，日本自転車振興会から，競輪収益の一部である機械工業振興資金の援助を受けて作成したものである。

NEW TECHNOLOGY & PRODUCTS 17

Advanced Materials

Electronics & Optics

Machinery & Mechatronics

Information & Communications

Process & Production Engineering

Construction & Transportation

Energy & Resources

Environment

Biotechnology & Medical Science

FLASH 41

INNOVATIVE PRODUCTION NOW

This section describes a specialized section or whole process of a representative factory which excels in specific aspects of production.

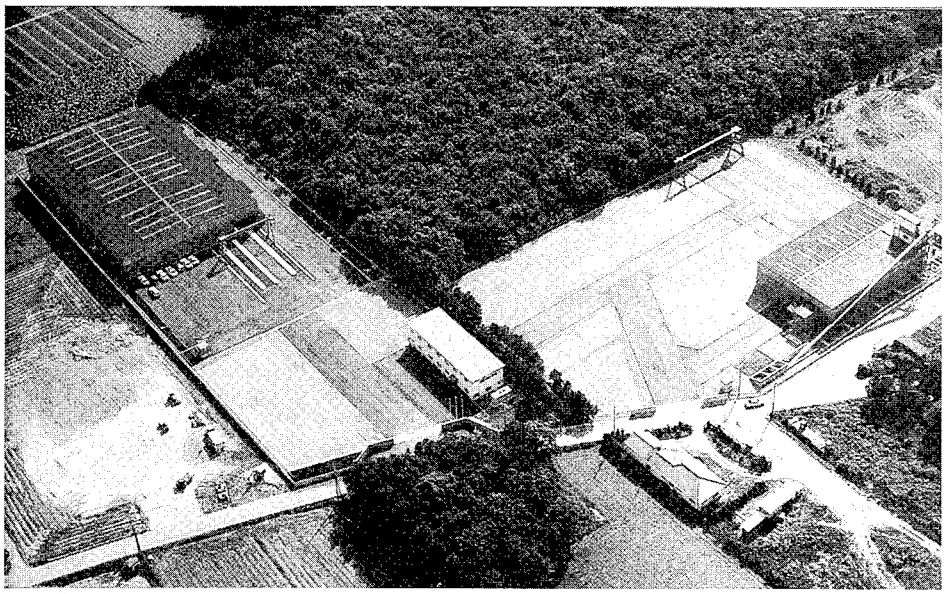
Modern Building and Construction Materials Manufacturing Plant for Housing & Civil Works
- Ibaraki Works of Ohmori Co., Ltd. -

1. Introduction

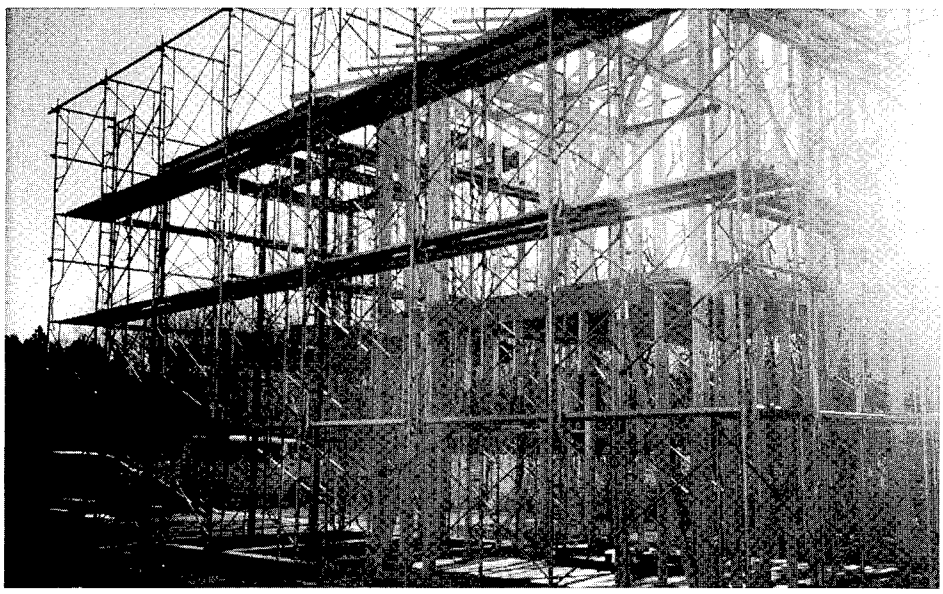
Today, there are various types of housing construction methods, and in addition to the existing housing companies, many corporations in other business fields are entering the housing industry with ideal characteristics and housing construction methods for personal houses.

These newcomers have constructed housing components manufacturing plants to reduce construction costs and aim at industrial scale housing construction.

Ohmori Co., Ltd., a leading civil engineering and constructor, especially in the field of sewage treatment systems, has entered into the housing business as a new business line from 1996, with houses featuring heavy steel structure-based underground rooms.



Aerial view of the Ibaraki Works (left: No.1 Works and right: No.2 Works) of Ohmori Co.



Demonstration heavy steel frame structure house (left) with comparable wooden structure house (right)

The company has constructed the two new plants at Ogawa-machi, Ibaraki Pref. for processing of heavy steel frames and bars, pre-cut processing of wood, and concrete products such as basement, soil concrete wall, U-shaped concrete products, etc.

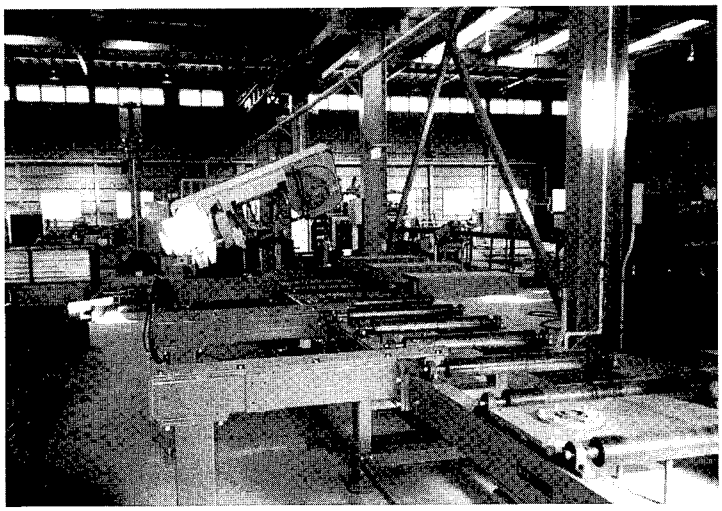
This issue introduces the Ibaraki Works of Ohmori Co.

2. Outline of Ibaraki Works

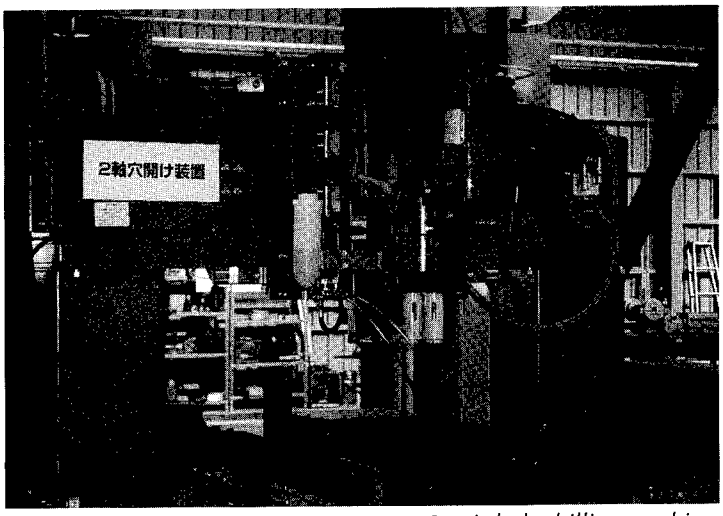
Ibaraki Works was constructed in 1997 and started operation from November.

This works is located in Ogawa-machi, Higashi Ibaraki-gun, Ibaraki Pref., and is two hours from Tokyo along the Joban Expressway by car.

The Ibaraki Works consists of two plants, separated into the No.1 Ibaraki



Steel sheets or H-shape steel frame cutting line



2-axis hole drilling machine

Works and No.2 Ibaraki Works.

Total land area is about 32,814 m^2, and total building area is 4,010 m^2 and divided into 2,514 m^2 for No.1 Works, 1,000 m^2 for No.2 Works, and 496 m^2 for office buildings. Total number of employees is 12 at present.

The construction concept of the works is to manufacture building materials to secondary concrete products, using the latest methods to realize high quality, and cost reduction merits, and also consider the preservation of the environment.

No.1 Works has 3 processing lines including steel frame processing, bar steel processing and wooden mouldings processing lines, and a painting booth which is constructed in the tent houses. This works can produce construction and building materials such as steel frames, bar steel products and wooden mouldings for housing construction and civil works.

No.2 works produce various secondary concrete products such as U-shape channels, concrete retaining walls, manhole covers, etc.

Thus, the Ibaraki Works can produce the various materials required for housing land preparation and civil engineering works.

Each production line has various types of automated and precision processing machines installed to boost production capability, and realize the production of high-quality products with cost reduction.

There are also specialists to provide better production management and to attain higher efficiency production.

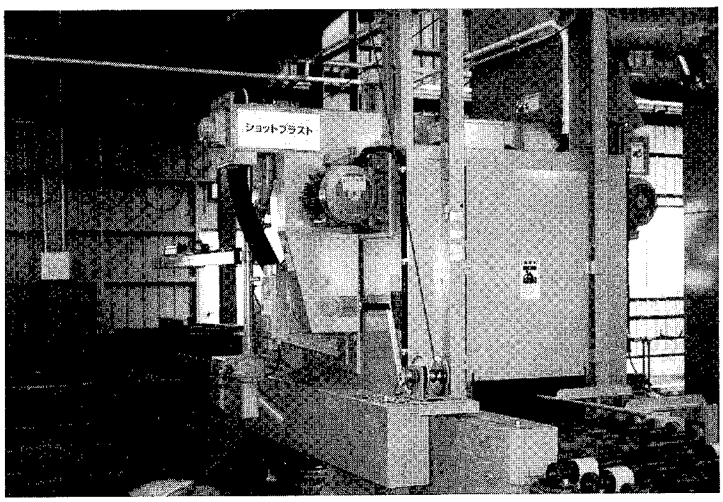
The company has also paid considerable attention to preserving the surrounding environment of the works. For instance, wastewater from the production process of secondary concrete products is filtered at the storage ponds by carbon dioxide neutralization equipment. Wooden dust generated at the wooden moulding process is also collected by dust collectors and used as fuel for boilers installed outside the works.

(1) Steel Frame Processing Line

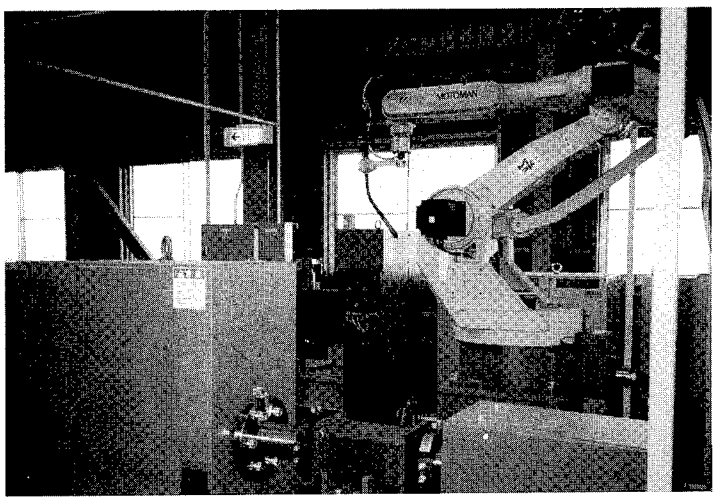
The steel pillars, beams, etc. for houses, and steel structures for use in civil works and breast wall are fabricated in this line. Modern machinery and equipment are installed including computer controlled multi-point welding robots, steel plate cutting machines, steel bevelling machines, shot blast machines, two-axes steel drilling machines, steel pillar joint welding machines and assembly jigs.

Steel frame materials are usually procured sheet steel, and sometimes H-shape steels.

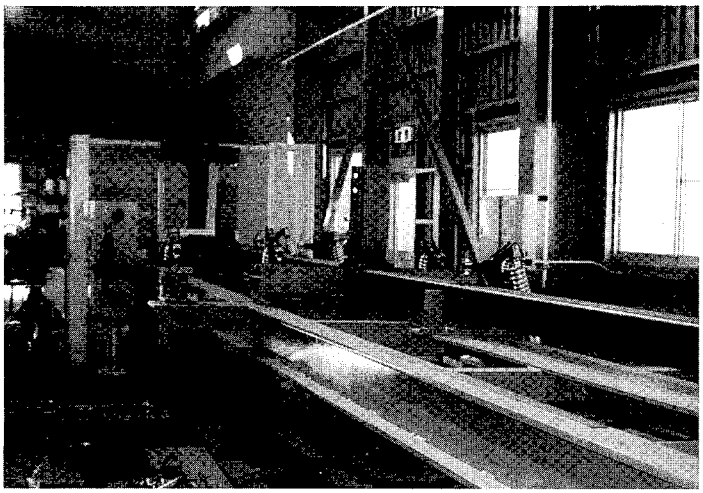
Steel frames are processed as follows. Steel sheets or H-shape steel frames are cut suitable dimensions by steel cutters, bevelling cut steel frames by bevelling machines to secure perfect welding, hole



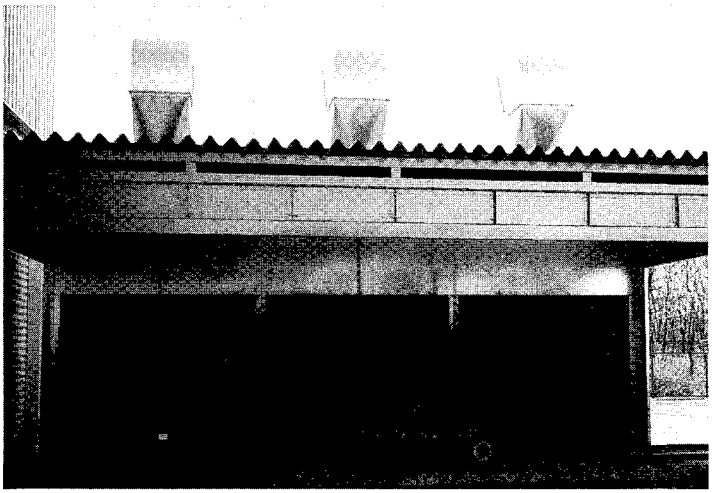
Shot blasting machine



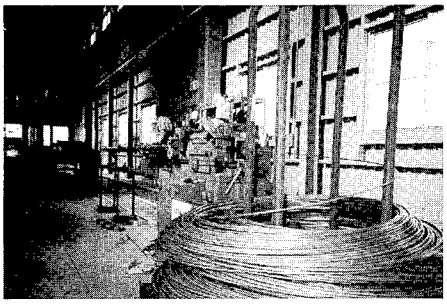
Steel frame welding operation by welding robots



Steel frame assembly and welding to produce pillars, etc.



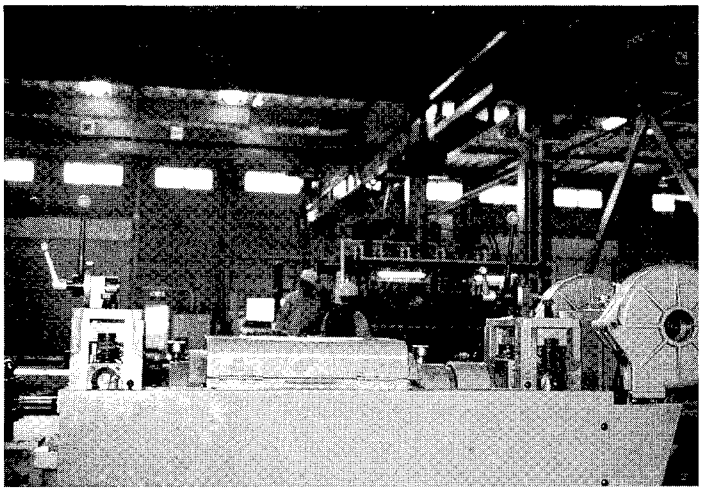
Product painting booth



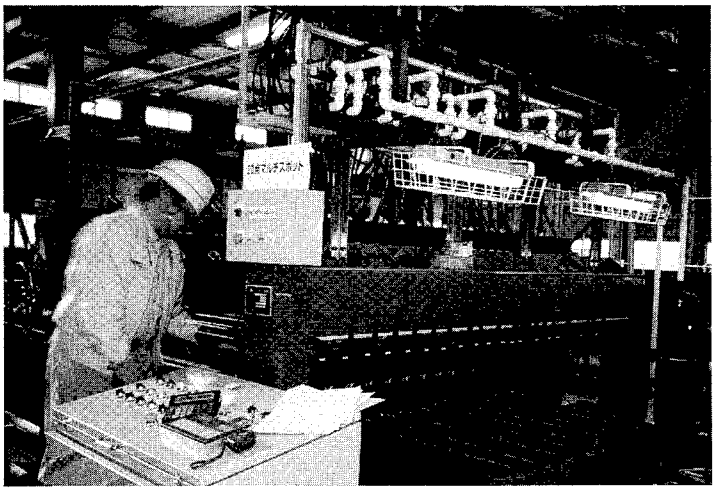
Coiled bar steel

drilling operations for 2 or 4 holes simultaneously for joints by two-hole drilling machines, shot blasting to remove rust on the steel frames, each steel frames are welded togethers by robot welding machines, and assembled steel frames to the pillars using assembly jigs and welded as pillars, and finished steel frame products are sent to the painting booths installed outside of the works for final painting. For transport of products, work carriers, overhead cranes, and gate type cranes are installed.

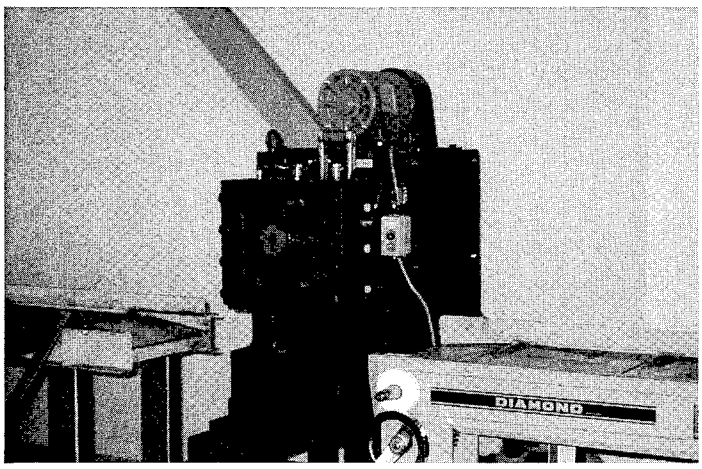
This line can produce the steel frames for 1 housing unit in two days for a two-story house with a total area of 105 - 116 m^2, and will have a processing capacity of about 300 tons/month of steel frames used for civil works such as shaft and shield tunnels.



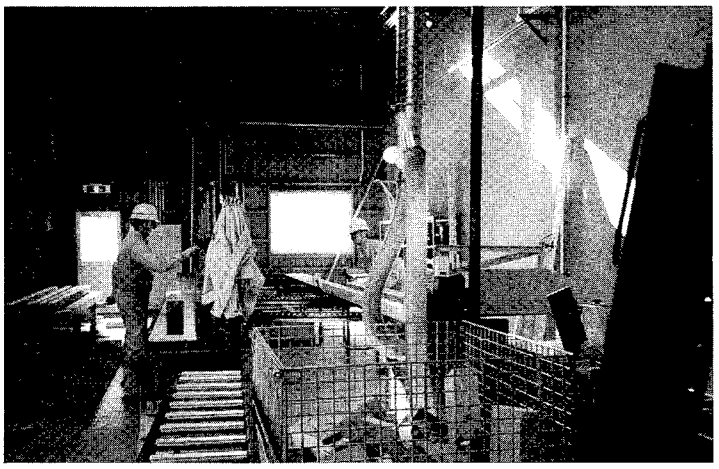
Coiled bar steel straightening machine



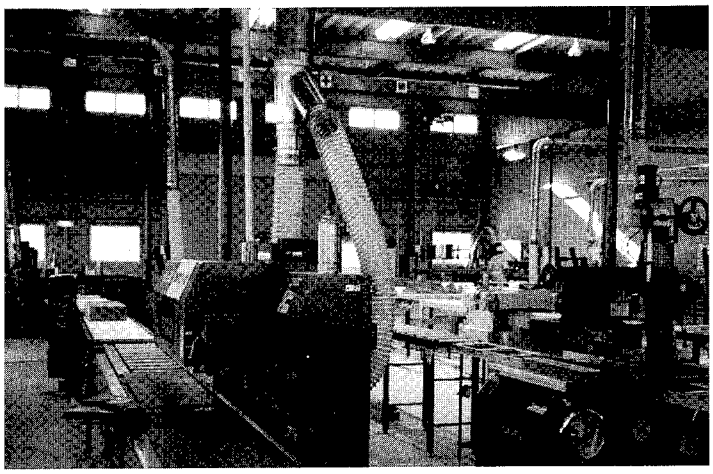
20-point spot welding machine



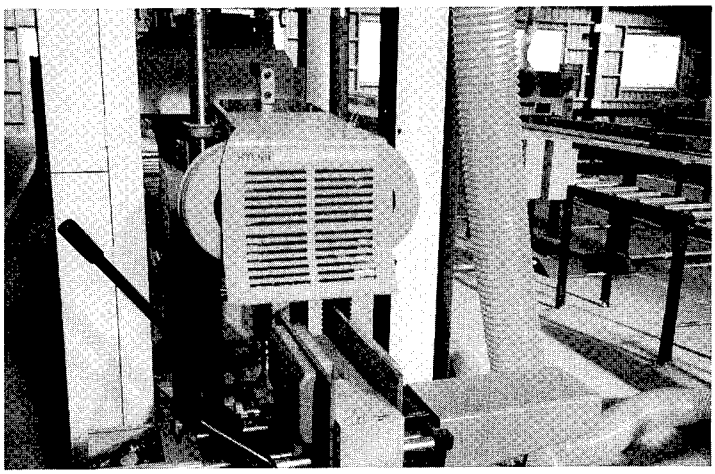
Large diameter bar steel cutter



Center marking and cut dimensioning operation



Inside view of pre-cut line (planers)



Pre-cut operation by double saw

2) Bar Steel Processing Line

This line produces the steel bar assemblies for houses with underground rooms, manholes used in sewage water systems, and secondary concrete products such as U-shape channels and retaining walls.

Usually, small diameter coiled bar steel is used as raw materials, but sometimes medium-diameter steel bars of the straight type.

This line consists of the following processes: Straightening the coiled bar steel by straightening machines, cutting by automatic bar steel cutting machines, assembled bar steels and welding of cross points by 20-point simultaneous spot welding machine, and bending operations of bar steel assemblies according to the product shapes freely by bending machines.

This line has a processing capacity of 200 tons/month of bar steel used for underground rooms.

(3) Wooden Moulding (Pre-Cut) Production Line

This line produces wooden pillars and wooden mouldings used for housing construction. This process is called the pre-cut process of woods in Japan.

The laminated wood is used as raw materials. The production processes are as follows: The laminated wood is selected for the dimensions and the center line on marked on the wood, cutting the decided length and width by cross cutting saw, planing by 2-surface or single surface planers, chiselling by hydraulic chisels, joining by automatic joining machines, mortice works by automatic machines, boring operation by boring machines, door sill grooving works by automatic machines, and superfine planing operations for finishing.

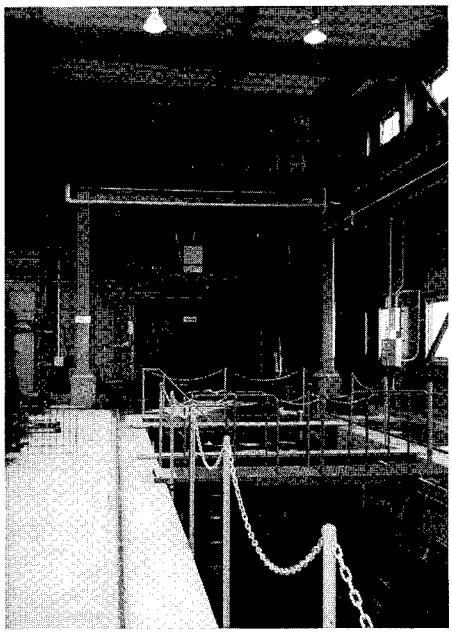
The configuration of wood and wooden mouldings processing machines in this line are flexibly distributed for both automatic and manual operation types.

The cutting and planing wood dust is collected by the pneumatic pipes distributed around the machines and line, and send to boilers for use as boiler combustion fuels.

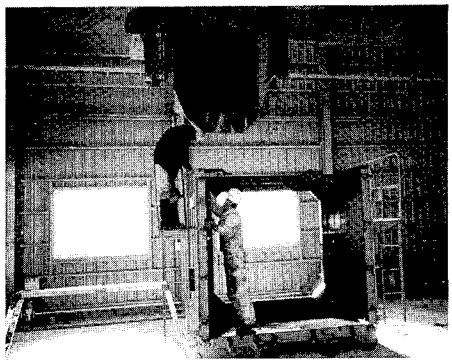
This line has a capacity of wood and wooden mouldings production for 1 house/two-day for a two-story house with total area of 105 - 116 m^2.

(4) Ready-Mix Concrete and Secondary Concrete Products Manufacturing Plant in No.2 Works

This line is constructed in the No.2 Works, and produces various types and sizes of secondary concrete products such as retaining walls, U-shape channels, manhole covers, and others, and ready-mix concrete.



Batcher plant and mold for concrete products



Mold preparations for large concrete products

The batcher plant with production capacity of 160m^3/day is installed and housed in the buildings.

The cement, sand, and aggregates for concrete production are stored at the ground levels, and a chute on the conveyor which is installed underground, and leads to the top part of the batcher plant.

The secondary concrete products are produced directly from ready-mixed concretes produced by the batcher plant using molds.

Unique underground floor designs are applied for production of large concrete products.

Unique concrete products are being developed and are now under patent applications.

Ohmori Co., Ltd.
15-8, Mizumoto 3-chome, Katsushika-ku,
Tokyo 125-0032
Tel. +81-3-3627-3221
Fax. +81-3-3627-3650

Ibaraki Works
1543-1, Fusenuma, Ogawa-machi, Higashi
Ibaraki-gun, Ibaraki Pref. 311-3412
Tel. +81-299-37-1231
Fax. +81-299-37-1234

TOPICS

This section describes selected developments of special importance or interest due to the achievement of a breakthrough or innovation in technology.

Beginning of "High-Efficiency RDF Power Generation System" Validation Testing

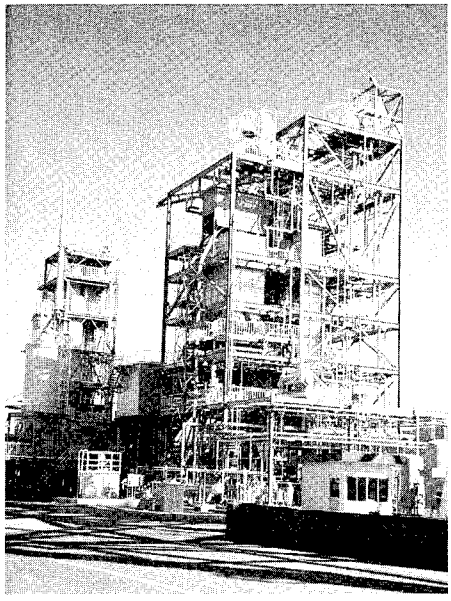
Electric Power Development Co., Ltd., has begun validation testing of "a new type of power generation system that utilizes solidified waste fuel (a high-efficiency RDF power generation system)."

These tests are part of operations supported by the MITI Agency of Natural Resources and Energy that have been continuing since December of 1995. The installation of the test equipment was completed in September of 1997 and operating adjustments have been carried out up to this point. However, since satisfactory operating conditions could be confirmed, it became possible to start formal validation testing.

This system is a high-efficiency power generation system that utilizes solidified refuse derived fuel which is made from trash that has been thrown away by households and which is disintegrated, dried and compressed. It possesses the two virtues of "high-efficiency power generation that is on a par with that of current thermal power generation plants" and "high-level exhaust gas processing" of which there are no other examples in the world.

With current waste product power generation, because there are such problems as instability of the fuel due to the high moisture content of the raw garbage is great and boiler corrosion from the hydrogen chloride that is produced, the power generation efficiency is low at 10-15% and, from the standpoint of raising its economic viability as a power generation operation, it is necessary to improve its efficiency. With Electric Power Development's high-efficiency RDF power generation system, the fuel used is RDF in a high calorific value of which is high compared to raw garbage and the boiler corrosion problem has been solved by employing a circulating fluidized layer boiler. It was designed to achieve a power generation efficiency that is on a par with that of current thermal power generation plants (35%).

In addition, for the processing of the exhaust gas, an exhaust smoke treatment system that uses activated charcoal is employed and, together with virtually completely decomposing the dioxins, it is possible to simultaneously process sulfur oxides, nitrogen oxides, hydrogen chloride and heavy metals. This is a system that was independently created by Electric Power Development and which applies dry denitrification equipment technology that it developed for use with coal fired power generation.



High-Efficiency RDF Power Generation System

Trash has become a serious social problem and a succession of inquiries and visits by local governments have been received regarding this system which, together with making practical use of trash as an unutilized resource, also possesses superior characteristics with respect to such environmental aspects as dioxin measures. At Electric Power Development, the plan is to make this system a practical reality at an early stage. Together with this, up to this point, investigations and "feasibility studies (FS)" have also been carried out regarding such things as RDF fuel characteristics, exhaust gas characteristics, the optimum power generation scale and the economic viability of electricity operations for the local governments that are planning to introduce RDF power generation.

Description of high-efficiency RDF power generation system		
Boiler		
* Manufacturer	Mitsubishi Heavy Industries, Ltd.	
* Format	Cycling fluidized bed boiler (external cycle; equipped with an external heat exchange apparatus)	
* RDF Fueling Amount	1 ton/hour (about 2 tons/hour calculated on the basis of raw garbage)	
* Steam Generation Amount	4.2 tons/hour (equal to a generated power output of 600 kW)	
* Steam Conditions: Pressure:	100 kg/cm^{2}g Temperature: 540 °C	
Exhaust smoke treatment system		
* Manufacturer	Sumitomo Heavy Industries, Ltd.	
* Format	Activated charcoal type exhaust smoke processing system	
* Exhaust Gas	6,000 m^{3}N/hour	
* Amount- Smoke Concentrations	SOx concentration:	5 ppm or less
	NOx concentration:	80 ppm or less
	HCl concentration:	50 ppm or less
	Soot and dust concentration:	30 mg/m^{3}N or less
	Dioxin concentration:	0.1ng/m^3 or less

Regarding the smoke concentrations, these were established with reference to such things as the "Air Pollution Control Law" and the "Standards for the Prevention of Recently Constructed Trash Incineration Plant Pollution." During design of a practical system, it will be possible to determine the optimum specifications (processing capabilities) by considering such factors as the replenishment amount for the activated charcoal based on the results of these tests.

* ***Electric Power Development Co., Ltd.***
Public Relations Dept.
6-15-1, Ginza, Chuo-ku, Tokyo 104-8165
Internet : http://www.epdc.co.jp

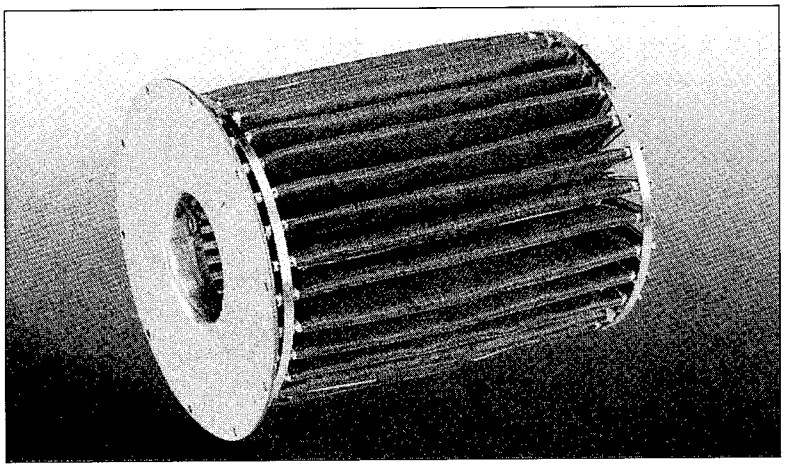
Environment - Friendly Diesel Engine Bus

Isuzu Motors Ltd. has developed a large-sized bus with a diesel engine that eliminates the emissions of particulate matter and nitrogen oxides (NOx) in the diesel black smoke to a level below the prescribed values of the major urban regions (seven leading prefectures and cities) in Japan.

A newly developed diesel particulate filter (DPF) and a gas emission recirculation system are introduced in combination, but the cost increase has been reduced to about one-half that of existing compressed natural gas (CNG) vehicles. In addition, compared with CNG vehicles, there is no need to use any fuel supplement stand. The company anticipates to sell 40 units of these buses annually for public service use.

Two units of a new type of DPF made of nonwoven type ceramic fiber (silicon carbide) are installed for particulate matter reduction, by which the DPF undertaking particulate matter combustion and regeneration and the DPF undertaking particulate matter collection are alternated by electronic control. NOx reduction is achieved by recirculating the exhaust gas together with intake air, by which the oxygen volume in the combustion chamber is decreased to lower the combustion temperature and to reduce NOx. Further, new technologies are introduced to eliminate the thermal deformation of the switchover valves for the two DPFs as well as to improve the wear resistance of the engine piston rings and cylinder liners.

* ***Isuzu Motors Ltd.***
Public Relations Dept.
6-26-1, Minami-oi, Shinagawa-ku, Tokyo 140-8722
Tel: +81-3-5471-1138
Fax: +81-3-5471-1042



Ceramic DPF device for black-smoke removing

NATIONAL R&D PROJECTS

This section describes various R&D projects being carried out in Japan on a national scale.

* ***Agency of Industrial Science and Technology, MITI***
New Sunshine Project Promotion Headquarters
1-3-1, Kasumigaseki, Chiyoda-ku, Tokyo 100-0012
Tel: 81-3-3501-1511
Fax: 81-3-3501-7928

FY1998 Science and Technology Budget of 890,699 Million Yen Planned, 4.9% Increase from the Previous Year

According to the FY1998 budget prepared by the Ministry of Finance, the Japanese Government will provide about ¥890,699 million in total, an increase of about 4.9% from the previous year or about ¥41,434 million, for promotion of science and technology fields.

1. FY1998 Science and Technology R&D Budgets by Projects

The FY1998 budget classified by projects is divided into ¥190,906 million for space development projects, ¥24,944 million for ocean development projects, ¥1,533 million for basic industrial technology development projects, ¥802 million for advancement of computer industry, ¥247,835 million for national research institutes, ¥27,000 million for specified R&D projects, ¥230,571 million for R&D subsidies and consignment, and ¥167,107 million for others.

(1) Space Development Budgets

Space development activities will be centered at the National Space Development Agency of Japan (NASDA), and funds of about ¥190,906 million are planned, an increase of 1.1 % from the previous year.

NASDA is responsible for participation in the International Space Station Programs, and development of the Earth Environment Observation Satellite, Optical Inter-Satellite Combination Test Satellites, Data-Relay Technology Experimental Satellites, Advanced Earth Observation satellites, H-IIA rockets and the Space Flyer Units or Japanese space shuttles, and R&D on the Moon Orbit Investigation Satellites, and promoting consolidation and construction of ground facilities for development of satellites and rockets.

The National Aerospace Laboratory (NAL) of the Agency of Science and Technology (STA) will continue research and basic technologies on winged, unmanned space vehicles and space plane.

The Meteorological Agency of the Ministry of Transport will conduct meteorological observation activities using stationary satellites, and the Communications Research Institute (CRL) of the Ministry of Posts and Telecommunications will also conduct R&D on advanced satellite communications and broadcasting technologies.

Accordingly, the total ¥190,906 million budget for space development will be divided into ¥177,883 million for NASDA, ¥2,624 million for NAL, ¥1,049 million for the Environment Agency, ¥27 million for the AIST, ¥11 million for the Electronic Navigation Research Institute (ENRI) of the Ministry of Transport, ¥5,618 million for the Meteorological Agency, and ¥2,946 million for the CRL.

In addition, space development related budgets included in other budget items other than the science and technology budgets account for about ¥198,510 million, so the total space development budgets amounts to ¥247,429 million.

(2) Ocean Development Budgets

R&D on ocean development in Japan is promoted by the Japan Marine Science and Technology Center (JAMSTEC), and the FY1998 budget for ocean development projects is about ¥24,944 million, an increase of 3.8% from the previous year.

JASMTEC will operate the ocean global research ship Mirai, deep-sea research ship Kairei, manned research submersible Shinkai 6500, and unmanned 10,000-class research submersible Kaikou for clarification of oceanic phenomena related to the changing conditions of the global environment.

JASMTEC will also conduct R&D on deep-sea environment frontier research, geographical observations, and utilization of ocean and marine biology research.

R&D on earth environment remote sensing technology, and development and utilization of the Kuroshio current will promoted by the STA and related ministries & agencies, and the basic survey and research on the development and cultivation of marine resources will

also be promoted by the Ministry of Agriculture, Forestry and Fisheries.

FY1998 budgets for ocean development other than this budget, or other budget items, is ¥72,381 million, so the total ocean development budget amounts to ¥89,725 million.

(3) Basic Industrial Technology R&D Budgets

About ¥1,533 million budget will provided, an increase of 7.3% over the previous year.

R&D activities are focused on basic and creative fields such as electronics, biotechnology, medical and welfare, and on research projects to respond to social needs. At present, twenty-two R&D projects including carbon-based high functional materials, atom technology (atomic and molecular ultimate operation technologies), artificial internal organs, etc. are involved.

(4) Promotion of the Computer Industry

This budgets will provide ¥802 million, a decrease of about 13.8% over the previous year, and will advance the computer technology in Japan. R&D is focused on the development of the new information technologies, called the real-world computing project, indispensable for the advanced information society in the 21st century.

(5) FY1998 Budgets for National Research Institutes

The FY1998 budgets for national research institutes other than space development and ocean development R&D budgets are ¥247,835 million, an increase of 4.2% over the previous year.

National research institutes are promoting research and development, and construction of research and development facilities.

The budget for experiments and research on pollution control technologies in the national research will be about ¥1,675 million, an increase of 2.4% over the previous year.

STA is also promoting the research and development of the next generation of structural materials (super steel materials), superconducting materials and next generation supersonic flyer technologies.

The Ministry of Agriculture, Forestry, and Fisheries is also promoting basic research on various fields including the clarification of the whole genome sequence, and development of on-site directed technologies as well as R&D on important themes for environmental issues.

MITI is promoting research and development on technologies for resources & energy, information, and new materials.

(6) Science and Technology Promotion Coordination Budgets

This budget will support important R&D themes necessary for the advancement of Japanese science and technology based on the policy of the Science and Technology Council.

In the FY1998 budget, about ¥27,000 million is provided for creating the Genome Frontier Exploring Research Promotion System, in which molecular level research on life phenomena will be conducted with close cooperation between governmental agencies, universities and private sectors, Open and Cooperative Research Promotion System in which different research institutes and research fields are integrated for strongly conducting research on boundary important fields to create the seeds, and the expansion of general research on information science and technology such as large capacity, high-speed information transmission and processing.

(7) Budgets for Subsidies and Consignment Costs for Science and Technology

This budget will provide subsidies to universities and private institutes for scientific research activities. The planned expenditures are about ¥118,248 million including the international contribution to the International Deep-sea Drilling Projects (budget proposed by the Ministry of Education). This budget will provide ¥21,800 million for securing and cultivation of young researchers, and for promotion of exploratory science and technological research important to the future.

This budget will also provide funds to reassert and develop idealistic technology to create and support new industry.

About ¥3,994 million is planned for research on the Human Frontier Science Program, and contributions to the International Human Science Program Promotion Organization, and others.

(8) Other Provisions

The budget also provides ¥27,423 million to the Japan Science and Technology Corporation (JST) for conducting basic research and development to expand the economic frontier.

The New Energy and Industrial Technology Development Organization (NEDO) is promoting R&D on generic industrial technology, global environment industrial technology, development and promotion of welfare equipment industrialization, industrial technology fellowship projects, and promotion of local consortium research and development, and newly implemented the new industry support-type international standardization development projects.

MITI is also promoting the consolidation and construction of quantum standards, experiment and evaluation standards.

Other funds are ¥2,594 million for the 40th South-Pole Observation Project including the regular maintenance of the observation ship Shirase, ¥1,055 million for earthquake general research to promote advanced and basic research on the earthquake survey and earthquake disaster prevention, ¥1,618 million for the development of global simulators which aim to clarify and forecast the changing of the earth by observation of global meteorological changes such as global warming and abnormal weather conditions, and ¥ 4,001 million for genome related R&D themes and ¥8,806 million for brain science research at Riken, and ¥267 million for production of brochures introducing the research activities and R&D evaluation results to the public in Japan.

The budgets will provide ¥13,261 million for the 10-Year Program for Cancer Conquest, and the grand total is ¥18,341 million including other budget items.

Table 1 FY 1998 Science and Technology Related Budget Plan by Projects

(Unit: ¥ million)

Item	1998	1997	Change
Space development R&D projects	190,906	188,767	+2,139
Ocean development R&D projects	24,944	24,030	+914
Industrial technology R&D projects	1,533	1,429	+104
Computer industry promotion projects	802	930	-128
National research institutes	247,835	237,838	+9,997
Science and technology promotion	27,000	24,950	+2,050
Science and technology subsidies and consignment	230,571	219,576	+995
Others	167,107	151,745	+15,842
Total	890,699	849,265	+41,434

2. FY1998 Science and Technology R&D Budgets classified by Ministries & Agencies

The FY1998 science and technology budgets classified by the administration or controlling ministries and agencies are ¥611 million for the National Diet, ¥419,688 million for the Prime Minister's Office, which includes the Science and Technology Agency, Defense Agency, Management and Coordination Agency, etc.,¥2,062 million for the Ministry of Justice, ¥768 million for the Ministry of Finance, ¥176,069 million for the Ministry of Education, ¥74,437 million for the Ministry of Health and Welfare, ¥89,737 million for the Ministry of Agriculture, Forestry and Fisheries, ¥82,089 million for the Ministry of International Trade and Industry, which includes the Agency for Natural Resources and Energy & the Agency of Industrial Science and technology, ¥15,179 million for the Ministry of Transportation. ¥20,971 million for the Ministry of Posts and Telecommunications, ¥908 million for the Ministry of Labor, ¥7,414 million for the Ministry of Construction, and ¥766 million for Ministry of Home Affairs (Table 2).

Table 2 FY1998 Science and Technology Related Budget Plan by Ministries and Agencies

(Unit: ¥ million)

Ministry & Agency	1998	1997	Change
National Diet	611	592	+19
Prime Minister Office	419,688	401,091	+18,597
Ministry of Justice	2,062	2,014	+48
Ministry of Finance	768	741	+27
Ministry of Education	176,069	166,184	+9,885
Ministry of Health and Welfare	74,437	70,994	+3,443
Ministry of Agriculture, Forestry and Fisheries	89,737	86,286	+3,451
Ministry of International Trade and Industry	82,089	78,031	+4.058
Ministry of Transport	15,179	14,613	+566
Ministry of Posts and Telecommunications	20,971	19,993	+978
Ministry of Labor	908	887	+21
Ministry of Construction	7,414	7,082	+332
Ministry of Home Affairs	766	757	+9
Total	890,699	849,265	+41,434

MITI-AIST Implements New R&D Promotion Systems from FY1998

The Agency of Industrial Science and Technology (AIST) of the Ministry of International Trade and Industry (MITI) will implement two new R&D promotion Systems, the University-Cooperative Type Industrial Science and Technology R&D Project and Industrial Technology Applied R&D Projects aim to create new industries to start from April 1, 1998 with ¥44,300 million in funds.

The University-Cooperative Industrial Science and Technology R&D Project aims to evaluate new theories and technological ideas of university researchers, and promote these theories and ideas to actual industrialization with the cooperation of researchers in industry. The Industrial Technology Applied R&D Project must support technology R&D activities with large risk, so cannot be conducted in private sector only.

At present, 6 themes have been selected, 4 themes for the University-Cooperative Type Industrial Science and Technology R&D Project, and 2 Industrial Technology Applied R&D Projects.

1. Selected R&D Themes for University-Cooperated Type Industrial Science and Technology R&D Project

(1) R&D on intelligent materials and structural systems

The R&D period is 5 years with a total budget of ¥900 million.

The R&D targets are the development of fiber or foil-state sensors such as optical sensors, and actuator materials and elements used for drives of piezoelectric ceramics, and the development of complicated structure systems with intelligent functions such as self-detection of cracks, autonomous correction of dangerous conditions, reduction of noise and vibration, and changeable shapes according to the outer environment by mounting these advanced structural components into machines, etc. which are expected for use in the aircraft, energy equipment, industrial machinery and construction fields.

The R&D period is 5 years with a total budget of ¥900 million.

(2) R&D on High Functional Materials Design Platforms

At present, the advanced application characteristics of various materials will required to satisfy low environmental load, recyclability, energy saving, and biosuitability etc. at the development stages.

This R&D aims to develop simulation technology for virtual experiments by applying the mesoscopic material design theory developed by Nagoya University, and realize high-speed, advanced and energy-saving material development technology.

The project period is scheduled to be about 4 years with funds of ¥400 million.

(3) R&D on Cat-CVD Semiconductor Device Manufacturing Process

Conventional CVD process semiconductor manufacturing causes defects by seizure on thin film surfaces and provides inferior device function to processes using plasma. The R&D aim is to establish a catalytic CVD semiconductor manufacturing process using the catalytic reaction between material gas and heated medium developed by the Hokuriku Advanced Science and Technology Graduate School University.

The catalytic CVD process is expected to realize the improvement of production yields, enable the cost reduction of manufacturing equipment by simplification equipment configuration, and produce large-area, high quality devices.

The R&D term is 3 years with funds of ¥400 million.

(4) R&D on Creation Technology of Particle Applied Bio-Combined Materials

This R&D aims to establish technologies for extracting bimolecular and chemical materials with specific combination, recombination and control of these molecular and chemical materials by using the latex beads (selective separation particles) developed by the Tokyo Institute of Technology.

By applying action and reaction of chemical materials and biomolecular materials, the development of sensor systems for detecting materials which are difficult to trace such as narcotics, and by analyzing chemical materials and bioreceptors coping with chemical materials, new fine chemicals will be created such as pulp fiber binding agents, etc.

The R&D period is 5 years with funds of ¥500 million.

2. Industrial Technology Applied R&D Projects

(1) R&D on Nanometer Control Optic Disc Systems

R&D will focus on the development of the nanometer ROM disc with surface density of 100 Gbit/cm^2 and transfer speed of 100 - 204 Mbit/s to cope with the needs of large volume information recording such as digital high definition moving picture transmission. The development of high density RAM with surface density of 10 Gbit/s is also an R&D target using the magnetic area response technology which enables the expansion of recording areas and reproduction by applying photonic and magnetic functions.

The R&D period is 5 years with funds of ¥1,200 million.

(2) R&D on Human-Harmonized and Coexisting Robot Systems

This R&D aims to develop multifunctional robots providing various services such as complicated and irregular works harmonized with humans or replacing human operators in various environments.

The R&D term is 5 years with funds of ¥900 million.

GENERIC TECHNOLOGY REVIEW

This section describes various basic research and development activities in Japan to inform the world about generic R&D efforts here.

Synthesis of Biodegradable Adsorbents for Recovering Rare Metals

Processing of Metal / Oxide Superlattices for Functional Material

Research to Form Acid-Resistant Mesoporous Material

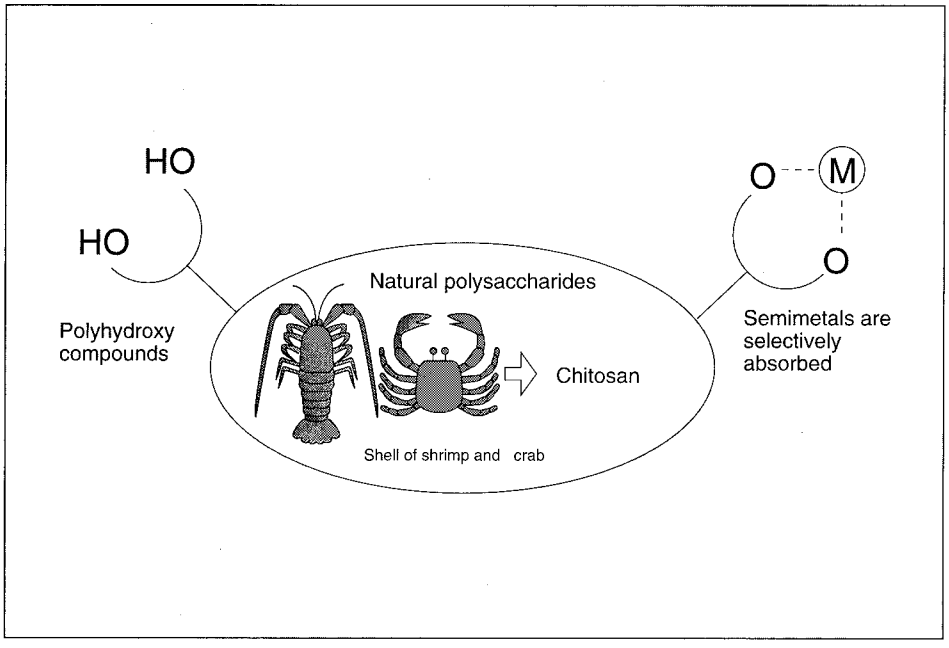
* ***Agency of Industrial Science and Technology, MITI***
Research Administration Division
1-3-1, Kasumigaseki, Chiyoda-ku, Tokyo 100-0013
Tel: +81-3-3501-1777
Fax: +81-3-3501-7899

Synthesis of Biodegradable Adsorbents for Recovering Rare Metals

Material Chemistry Department, Kyushu National Industrial Research Institute, Kyushu, Agency of Industrial Science and Technology

It is considered that the development of material-recycled-type technology well-adapted to the environment is one of ways to solve global environmental problems. In order to minimize environmental disruption, valuable materials used must be recovered and recycled and the technology for recovering and recycling materials itself must be-well-adapted to the environment.

In these viewpoints, we develop the syntheses of biodegradable absorbents using polysaccharides such as chitosan for selective separation and recovery of semimetals such as B, Ge, Te etc., which have attracted great attention because of their unique electronic, chemical and biological properties as well as their industrial application.



Biodegradable absorbents

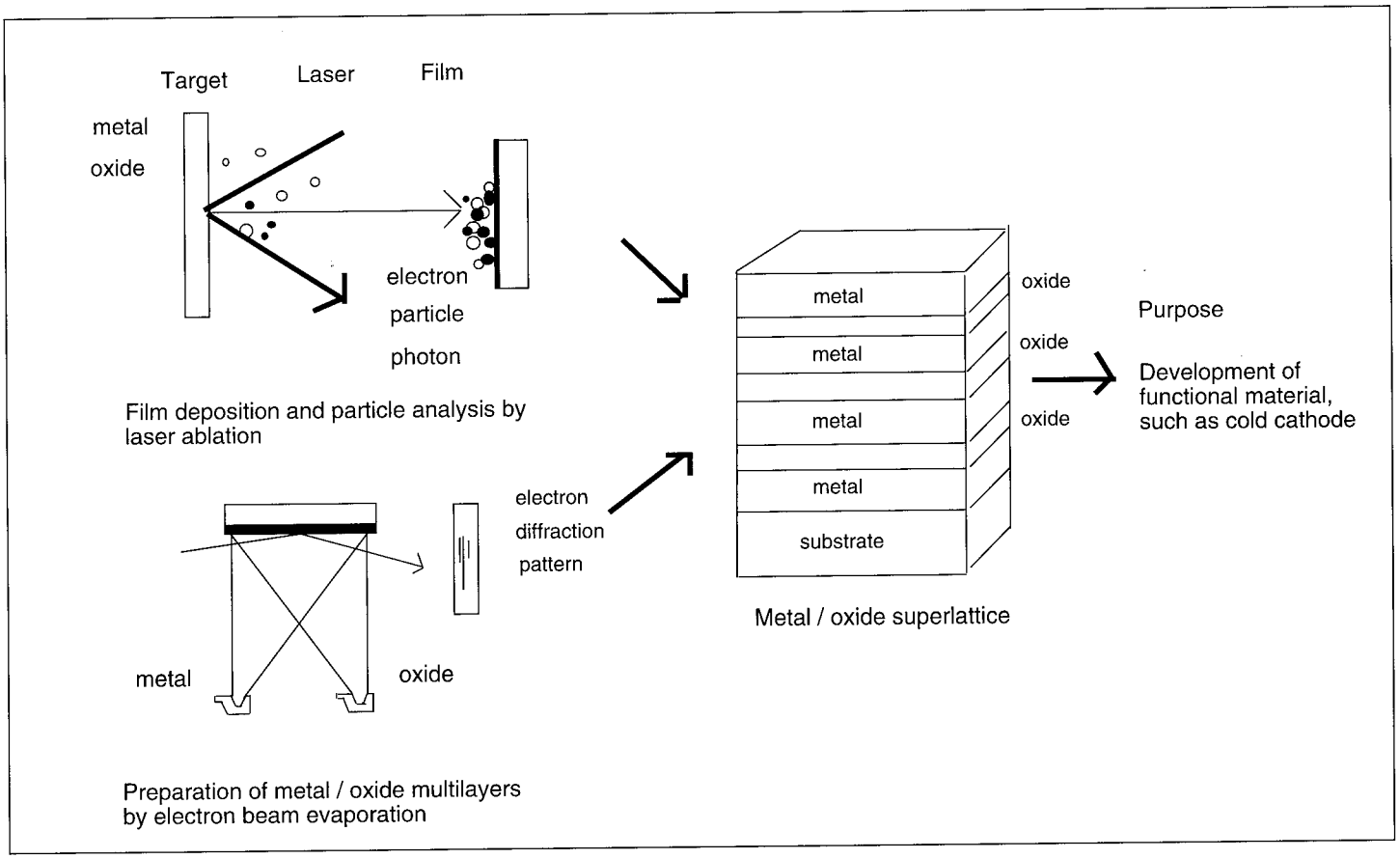
In general, however, since most of semimetals are present as oxyacids or oxyanions in aqueous solutions, conventional adsorbents for separating metal cations can not be used for separating and recovering semimetals. Therefore we intend to synthesize the high-selective adsorbents of semimetals by introducing polyhydroxy compounds to polysaccharides as illustrated below, because semimetals are known to have a tendency to form chelates with polyhydroxy compounds.

Processing of Metal / Oxide Superlattices for Functional Material

Chugoku National Industrial Research Institute, Research Period 1997-2001

Objective

Some kinds of metallic oxide are known to show superior electric, ferroelectric, magnetic, or optical properties. We have successfully fabricated metal / oxide multilayered films, and eventually, superlattices by laminating metallic layer and oxide layer periodically in the atomic scale. These thin films are theoretically expected to show excellent functional properties.



Analysis of deposition mechanism - Preparation of metal / oxide superlattices - functional materials

In this research, dynamic processes related with thin film growing and surface processing are to be clarified, conditions are to be refined for fabricating the metal / oxide superlattices with better quality, and the feasibility is to be investigated for applying the metal / oxide superlattices as functional materials.

Contents

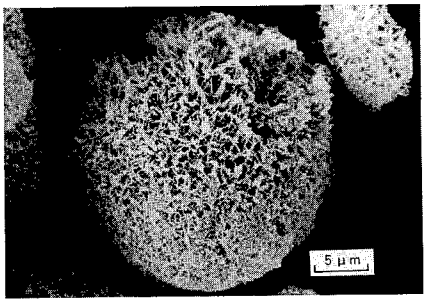
Dynamic processes of electrons, ions, neutrals, and photons emitted from target materials are clarified. The behavior of processing on the substrate in the atomic scale is also to be studied. The results are to be applied for researching conditions of fabricating metal / oxide thin films with better quality. The feasibility of applying the superlattices to a cold cathode is to be examined, and the efficiency of the electron emission is to be investigated.

Research to Form Acid-Resistant Mesoporous Material

Environmental Material Research Laboratory, Fine Materials Department, Kyushu National Industrial Research Institute, Agency of Industrial Science and Technology

The objective of this research project is to remove calcium from lamellar hydrous calcium silicate with an acid to form a silica mesoporous material with controlled modes, and to establish a technology to utilize the material in sectors permitting the mesoporous material to be utilized for environmental purification.

Hydrous calcium silicate is synthesized from lime and silicate by a hydrothermal reaction at a temperature lower than 200 °C. The crystal morphology and state of its crystal grain agglomeration can be adjusted with comparative ease by controlling the synthesis conditions such as CaO/SiO_2 molar ratio, water/solid ratio, reaction temperature, reaction time and stirring speed. Also, by selecting optimum acid treatment conditions, it will be possible to remove Ca^{2+} ions from inside the crystals without destroying the crystal outside shape. Therefore, by applying ideal hydrous calcium silicate synthesis and acid-treatment methods and conditions, it will be possible to produce a silica nanoporous substance or a nanoporous-macroporous compound retaining the crystal original shape and state of agglomeration. The porous substance is conceived to feature functions not displayed by other porous substances of simple form.



Silica nanoporous-macroporous compound

These newly developed porous substances will be used intact or given additional functions and the integrated functions evaluated in sectors relating to aqueous environmental purification. Specifically, these substances will be applied to the purification and recycling of treated waste liquids as well as to the decomposition of harmful organic substances in water.

Photo 1 shows a silica nanoporous-macroporous compound obtained through the acid treatment of a tobamolite crystal aggregate, which is attracting attention as a new type of filter aid.

98-02-100-01

Precision Aircraft Takeoff / Landing Experiment Using Realtime Kinematic GPS

The National Aerospace Laboratory of the Science and Technology Agency has used a global positoning system (GPS) that is about 1,000 times more accurate than conventional systems and has succeeded in conducting an experiment to measure aircraft positions most accurately in real time.

Fig. 1 shows a conceptual diagram of the experiment system. The GPS receiver is installed at the reference (datum) point on the ground with respect to the target aircraft, and observation data received on the ground are transmitted intact to the aircraft. Ground data are used to eliminate any intrinsic GPS error. Meanwhile, the aircraft inputs these ground data and the observation data acquired with the GPS receiver are entered into a computer to compute its position.

These flight tests were conducted repeatedly to confirm aircraft navigation accuracy in takeoff and landing operations, as well as in airstrip approach and touch-and-go operations. Fig. 2 shows the aircraft path in touch-and-go operations as computed by kinematic GPS in real time. The accuracy is theoretically within a range of several centimeters, which is about 1,000 times more accurate than conventional observation systems.

The GPS is a satellite position measuring system that is used widely by car navigation systems and its measuring accuracy is normally in the 100-m order. However, when using a special type of observation data known as carrier wave phase, the position measuring accuracy can be improved to the level of a few centimeters. This technique is known as the kinematic DPS technique. This carrier wave phase is rather difficult to handle, and the utilization of this technique in real time had been regarded as quite difficult, but was established successfully this time.

The new system is applicable not only to the field of aerospace development but also to various other fields including the observation of seismic earth crust changes, agriculture and the automatic operation of industrial machinery.

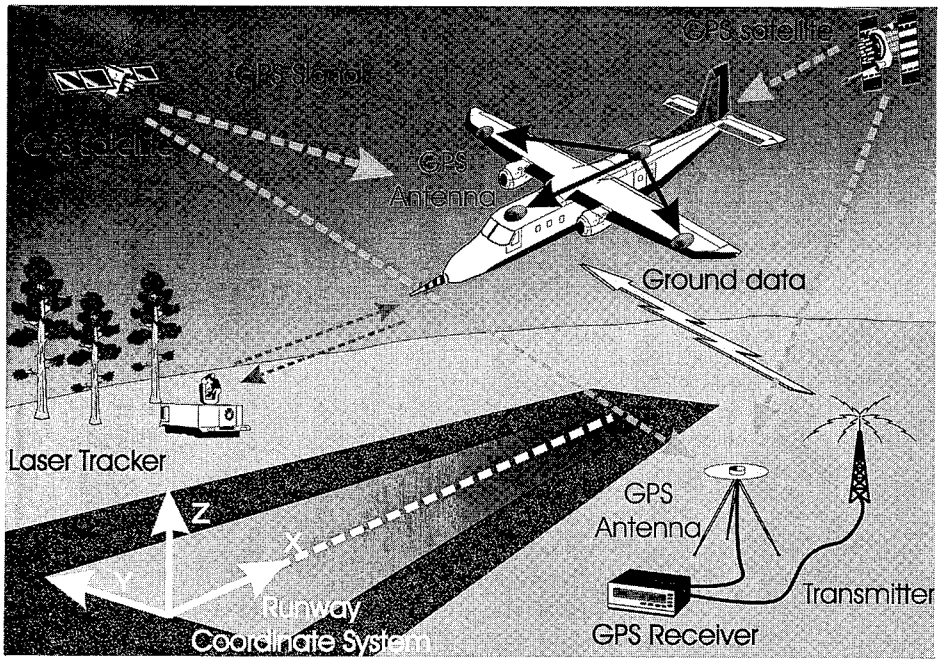


Fig. 1. Conceptual Diagram of Real Time Kinematic GPS Flight Experiment System

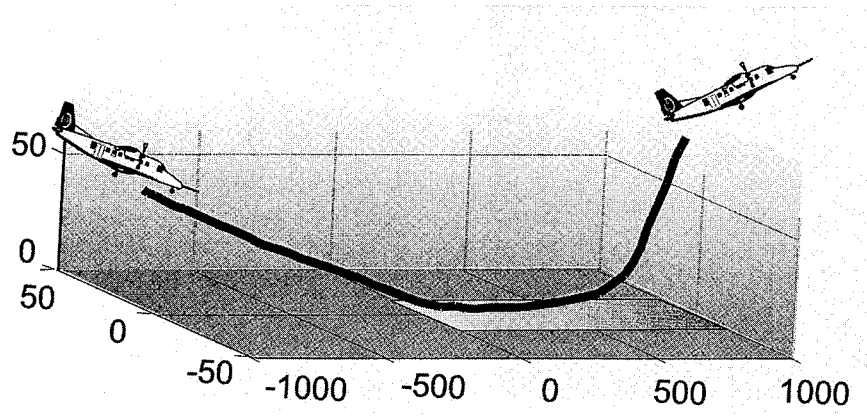


Fig. 2. Flight Path in Aircraft Touch-and-Go Experiments (Realtime Computed Data)

* ***The National Aerospace Laboratory of the Science and Technology Agency***
7-44-1, Jindaijihigashi-machi, Chofu City, Tokyo, 182-8522
Tel: +81-422-47-5911
Fax: +81-422-42-0566

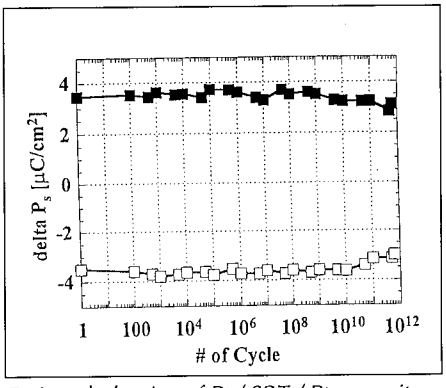
98-02-100-02

Low-Temperature Synthesis of Ceramic Thin Films for Ferroelectric Non-Volatile Memories

The National Industrial Research Institute, Nagoya, of the Agency of Industrial Science and Technology has announced that a ferroelectric non-volatile memory utilizing the hysteresis characteristic that is intrinsic to ferroelectric bodies can reduce the data write-in time to 1/100,000 and the power consumption to about 1/4 compared with conventional types of dielectric memories. Also, large-scale integration can be anticipated since the cell size can be reduced to 1/3.

The ferroelectric thin film materials for non-volatile memories primarily consist of $Pr(Zr,Ti)O_3$(PZT) and $SrBi_2Ta_2O_9$(SBT). PZT is characterized by a comparatively large residual polarization, but the critical defect is the large anti-field attribute necessary for polarity inversion, and when polarity inversion (write-in, read-out) actions are repeated, the polarity value is

changed (ageing). SBT is a lamillar perovskite compound and does not have such a large residual polarity, and is not fatigued even by repeated polarity inversion. However, it requires a high-temperature process, and assembling in the silicon semiconductor process is difficult.



Fatigue behavior of Pt / SBT / Pt capacitors at an applied voltage of 3 V and frequency 1MHz

The Electronic Ceramics Laboratory of the Ceramics Science Department, National Industrial Research Institute, Nagoya, began joint research with Arizona State University (U.S.) through which it devised an optimum precursor solution chemistry for temperature reduction of the SBT ferroelectric thin film synthesis process, by which low-temperature crystallization of thin films became possible. Strontium and bismuth alkoxide react in alcohol and form a double alkoxide containing the two type of metals, or strontium and bismuth, in a molecule. Next, this double alkoxide and tantalum alkoxide are reacted and a triple alkoxide with the metallic atomic ratio of Sr:Bi:Ta =1:2:2 is prepared. Spectroscopic analysis showed that the triple alkoxide metal-oxygen alignment closely resembles the auxiliary lattice of layer-structured perovskite SBT crystal. When this compound alkoxide solution was given partial hydrolysis treatment for producing a thin film, and a thin film was formed by the spin-coating method on a silicon substrate with the surface preformed beforehand with platinum as the underside electrode, the thin film was directly crystallized into SBT perovskite single phase at less than 550 °C, and assumed a 115 orientation. Further, when the temperature was raised to 700 °C, the crystallinity was improved considerably. Crystallization at this relatively low temperature is due to the resemblance of the structure of the prepared precursor triple alkoxide to that of the auxiliary lattice of the SBT crystal, so that the crystallization activation energy level had been lowered.

The SBT thin film with a thickness of 130 nm was heat treated at 650 °C and displayed a good hysteresis characteristic, as well as a comparatively good ferroelectric characteristic even with low-temperature treatment. When the change in the residual polarity value with respect to the frequency of polarization inversion was investigated in connection with SBT thin film heat treated at 700 °C, it was confirmed that the residual polarization was hardly changed even with respect to 10^{10} polarization inversion cycles (refer to appended diagram), so that the thin film has an excellent fatigue characteristic that shows the possibility of application to memories.

This process may become a breakthrough to the commercialization of ferroelectric non-volatile memories.

*** *The National Industrial Research Institute, Nagoya, AIST***
1-1, Hirate-cho, Kita-ku, Nagoya City, Aichi Pref. 462-0057
Tel: +81-52-911-2111
Fax: +81-52-916-6992

98-02-100-03

Complex Automobile Control System for Merging and Lane Changing

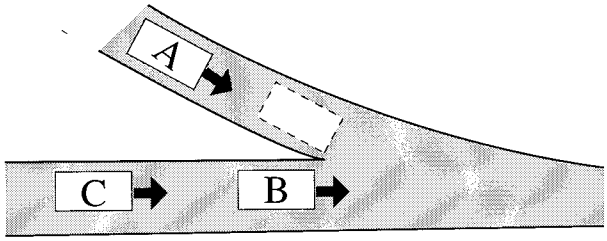
The Mechanical Engineering Laboratory of the Agency of Industrial Science and Technology has developed an automobile operation system to control the merging and lane changing of running automobiles.

A distinct characteristic of this automobile operation system is that the basic automobile operation rule of running a car while maintaining a fixed distance with the automobile in front has been applied to vehicle merging automobile lane changing. Therefore, there is no need for fitting a new sensor in the automatic operation automobile currently under development, and the operation system can be applied almost intact.

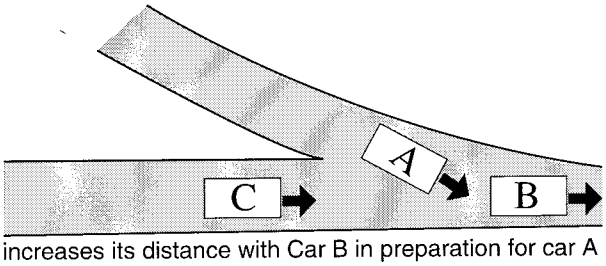
With this new auto control system, when two automobiles merge at the road convergence parts of expressways, for example, the car reaching the merge point first continues to run freely. Meanwhile, the car entering the merge point next assumes that a car has entered the merge point before and lowers speed to maintain a fixed car distance before the merge point. Therefore, when merging, an adequate car distance is maintained. When a car permits another car to move in in front, the car running behind maintains double the ordinary distance with the previous car in preparation for the merger.

Vehicles which run in succession are merged on a computer to confirm smooth disposition. The same system is also usable for controlling car lane changes. However, several cars running in succession can be made to merge smoothly, but

Mechanism of the newly devised car merging system



Car A lowers its speed to maintain a safe intervehicular distance



Car C increases its distance with Car B in preparation for car A merger

there is the problem of the car flow getting gradually worse.

* ***The Mechanical Engineering Laboratory AIST***
1-2, Namiki, Tsukuba City, Ibaraki Pref. 305-8564
Tel: +81-298-58-7036
Fax: +81-298-58-7037

98-02-100-04

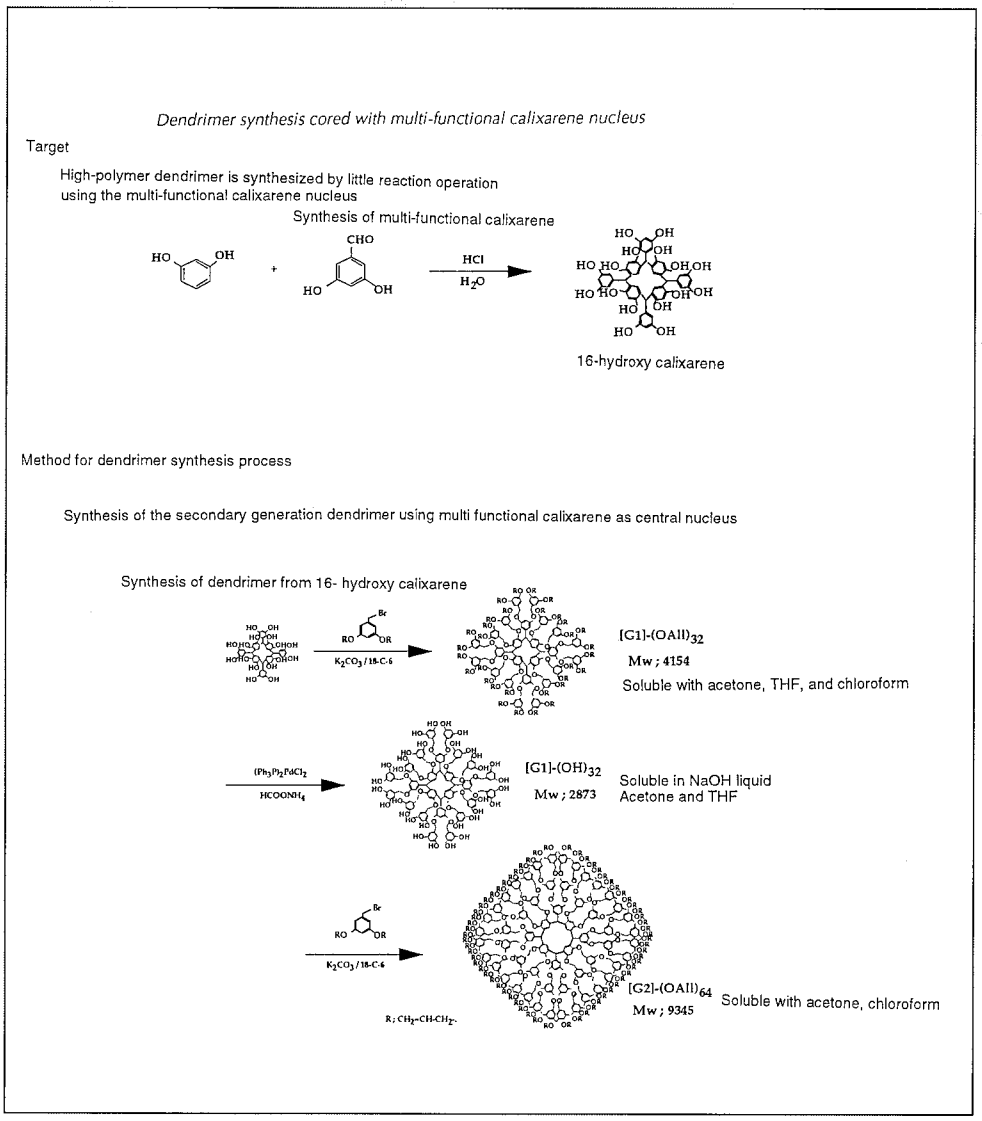
Simplified Method for Dendrimer Synthesis

A simplified technique has been established to synthesize dendrimers, spherical polymer compounds, as a part of the Technology for Novel High-Functional Materials project, implemented through the Industrial Science and Technology Frontier Program of the Agency of Industrial Science and Technology.

The dendrimer, due to its characteristic spherical shape and the arrangement of numerous functional groups on its molecular surface, is anticipated to be a new functional material for various applications such as pharmaceuticals, electronic materials, chemistry and micromachines. However, its synthesis requires an AB2 type monomer as the starting material which is linked to central nucleus by sequential bonding (divergent method). In another method, first an external nucleus is formed from AB2 molecule, and then it is bonded to the central nucleus (convergent method). However both these methods require protection of active groups with special protecting agents and repeated multistep reactions including deprotection reactions. Such a complicated multistep synthesis was a major obstacle in the production of dendrimers on mass scale and there had been no example of its commercialization.

Research team investigated a method to synthesize dendrimer with the central nucleus consisting of multifunctional compounds. The central nucleus is formed of calixarenes which are large cyclic compounds with 8-16 hydroxyl groups as reactive groups. Using these calixarene compounds, dendrimers consisting benzyl ether units were synthesized. As a result, it became possible to obtain dendrimers with molecular weights as high as 9,300 even with second generation versions. The dendrimers obtained feature a high surface functional group density, can be incorporated with the alkali soluble property, and are expected to be applicable as functional materials.

* ***National Institute of Materials and Chemical Research, AIST***
1-1, Higashi, Tsukuba, Ibaraki City Pref. 305-8565
Tel: +81-298-54-6348
Fax: +81-298-54-6327



NEW TECHNOLOGY & PRODUCTS

This section provides information about recently developed technologies and products, divided into Advanced Materials, Electronics & Optics, Information & Communications, Process & Production Engineering, Construction & Transportation, Energy, Environment, and Biotechnology & Medical Science.

Advanced Materials

98-02-001-01

Non-Tempered Bar Steel for Manufacturing Industrial Machines

Kawasaki Steel Corp. has developed a bar steel of large diameter (over 90 mm) that requires no tempering or annealing to increase its strength and toughness and is usable for manufacturing industrial machines.

With the newly developed bar steel, copper, titanium and niobium are added into the pig iron at a fixed ratio in the steelmaking processs, after which the hot-rolling and cooling conditions are controlled to obtain a high level of strength and toughness comparable to that of alloy steel.The bar steel can be used directly for machine fabrication, so the bar steel achieves cost reduction and improvement of working environment.

Normally, the bar steel is cut , machined and formed into the desirable shape, followed by quenching and tempering. But with the new bar steel, these heat treatments are unnecessary, and a strength comparable to that of alloy steel is obtained. The quenching and tempering cost is usually 20-30% of the bar steel cost, so users such as machine tool and construction machinery manufacturers can simplify production processes, lower labor costs and decrease expenditures. The new bar steel also features an excellent machinability, so tool lives are also prolonged to double their normal service lives.

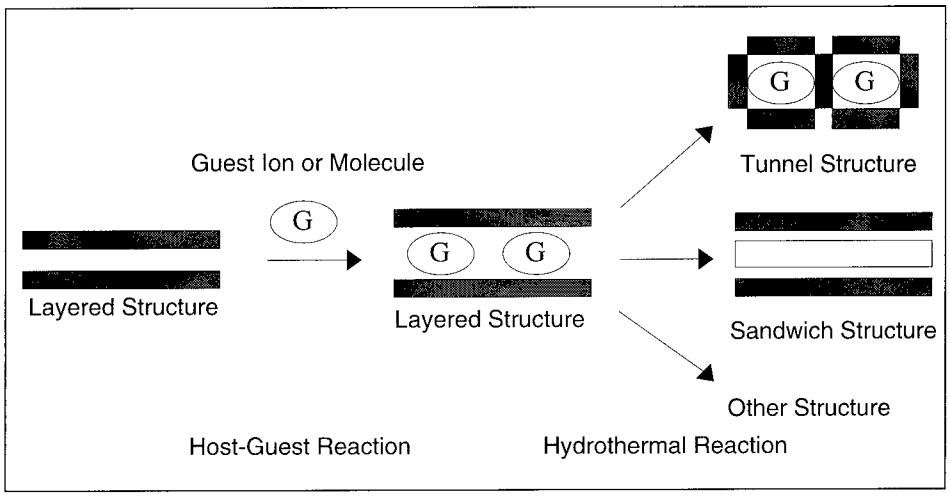
* ***Kawasaki Steel Corporation***
Public Relations Section
2-2-3, Uchisaiwai-cho, Chiyoda-ku, Tokyo 100-0011
Tel: +81-3-3597-3845
Fax: +81-3-3597-4911

98-02-001-02

Hydrothermal Soft Chemical Process for Synthesis of Manganese Oxides with Tunnel and Sandwich Layered Structures

Qi Feng of the Research Laboratory of Hydrothermal Chemistry, Faculty of Science, Kochi University, has established a soft hydrothermal chemical process for application as a new inorganic material synthesis process that is based on the combined use of a soft chemical reaction and the hydrothermal reaction.

Various processes have been developed to synthesize inorganic materials, such as the conventional sintering process, eutectic process and hydrothermal process, and more recently the sol-gel process, CVD process and sputtering process, through which considerable advances have been achieved in the aspects of control of material crystal structures, compositions and morphology. However, while these synthesis methods and processes all differ from each other, they do have common characteristics. This is because the compositions and crystal structures of the starting substances are temporarily disintegrated, then recombined into substances with the new composition, crystal structure or morphology. Accordingly, in general, the crystal structures and crystal morphology of these newly formed substances are entirely dif-



Conceptual Diagram of Hydrothermal Soft Chemical Process

ferent from those of the starting substances.

With this new process, a substance with a layered crystal structure is used as the precursor. Firstly, a guest ion or molecule is inserted in the crystal structure by the host-guest reaction (soft chemical reaction). The substance injected with the guest ion or molecule then undergoes hydrothermal treatment and the layered crystal structure is transformed into some other crystal structure. In this process, the chemical bonding of the layered structure is severed only partially or not at all, so it is possible to predict or control the crystal structure and crystal shape of the formed substance. By applying this process, the research team succeeded in synthesizing 6 types of manganese oxide with tunnel structures for use in the fabrication of lithium secondary batteries, ion sieves and molecular sieves.

A layered compound that sandwiches manganese oxide and lithium-aluminum oxide was synthesized successfully also by this new technique. This compound consisted of alternate laminations of a sheet of manganese oxide 0.4 mm thick and a sheet of lithium aluminum oxide 0.5 nm thick. Therefore, the laminations 1 nm thick consist of a combination of an electrically conductive manganese oxide sheet and an insulating hydroxide sheet, or a two-dimensional electrically conductive compound that is anticipated to have a wide range of applications.

* ***Kochi University***
2-5-1, Akebono-cho, Kochi-City, 780-8520
Tel: +81-888-44-8350
Fax: +81-888-44-8362

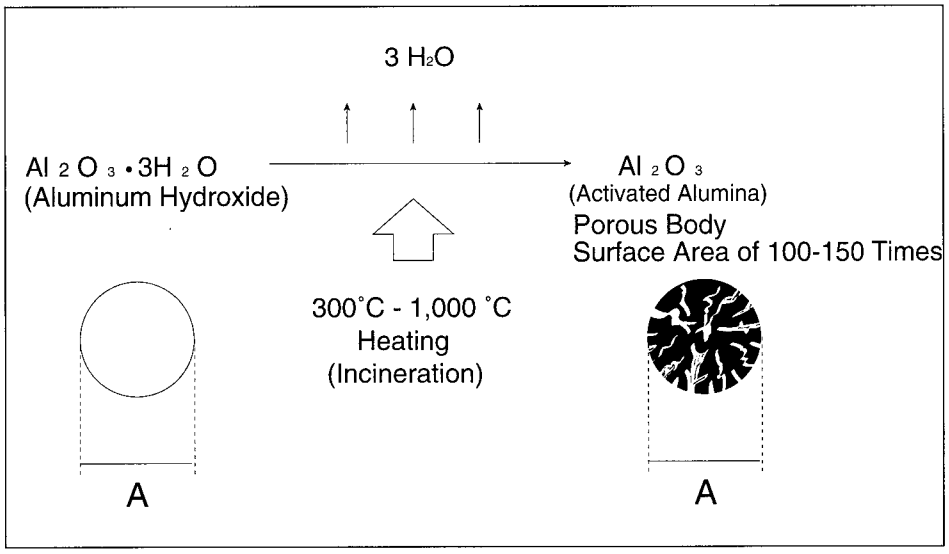
98-02-001-03

Film for Adsorption of Dioxin in Incineration Furnaces

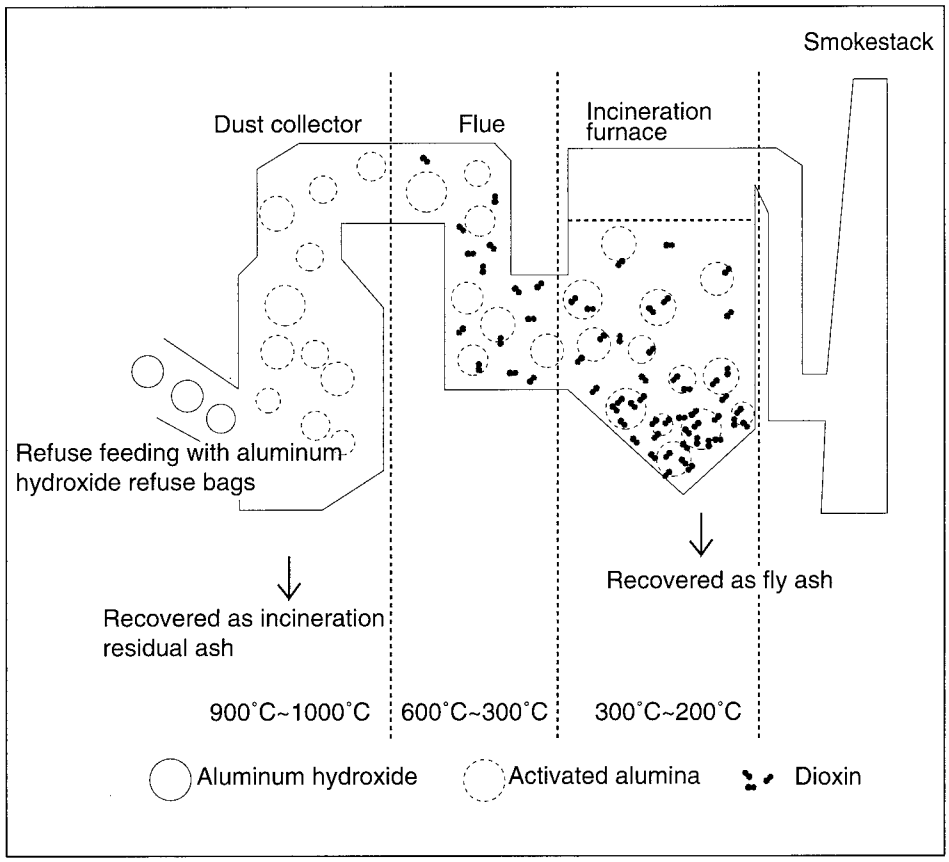
Sumitomo Chemical Co., Ltd., jointly with Nichimen Corp. and Nihon Green Packs Co., Ltd., have developed a plastic film Suial Power (trade mark under registration) that suppresses the discharge of toxic substances such as dioxin from incineration furnaces during fuel combustion.

Suial Power is a translucent polyethylene film consisting of 30-40% of aluminum hydroxide given a special treatment. Combusting the film converts the aluminum hydroxide into activated alumina of large surface area, which adsorbs and immobilizes the harmful substances generated in the combustion furnace. Experiments confirmed that as much as 60% of dioxin at a density of 5 ng/ml is removed.

The heavy metals contained in the residual ash, when effused by rain water, are adsorbed and immobilized by activated alumina, so there is no fear of heavy metals from the disposed residual ash seeping into undergound water. In addition, by promoting combustion, the density of carbon monoxide is decreased. The research team plans to confirm the effect with an actual incineration furnace.



Adsorption System of Aluminum Hydroxide (Activated Alumina)



Retention Pattern Inside Incineration Furnace Smokestack

For the time being, the film will be commercialized with priority given to use in the manufacture of refuse bags for use by regional autonomous entities where anti-atmospheric pollution measures of incineration furnaces have high priority. Samples of the film were shipped from the early part of December last year, and the target production volume in two years is set at 3,000 t, and a sales of ¥2-3 billion is anticipated.

* ***Nihon Green Paks Co., Ltd.***
10-11, Shironosato, Nagaokakyo City
Kyoto 617-0835
Tel: +81-75-954-5158
Fax: +81-75-955-3341

98-02-001-04

High-Sensitivity Ion Detection Film

The Takasaki Establishment (JAERI Takasaki) of the Japan Atomic Energy Research Institute (JAERI) has succeeded in synthesizing a polymer film that can detect ions such as cosmic radiation rays at a high sensitivity that is about ten times more sensitive than conventional types of detection films. The ion detection technology was developed with the cooperation of Prof. K. Ogura of Nihon University, and the polymer synthesis technique with the cooperation of Fukuvi Chemical Industry Co., Ltd.

This film is an improved version of CR-39 (diethyleneglycol-bis-allyl carbonate), a polymer that is readily decomposed by irradiation. It is synthesized by adding a small volume of reactive molecules to polymerized molecules. Fig. 1 shows the conditions of reaction. The polymer is formed into a film at 70 °C, and is stable at room temperature.

In experiments, a film 1 mm thick was formed, irradiated with various ions, followed by alkali etching (Fig. 2 shows the

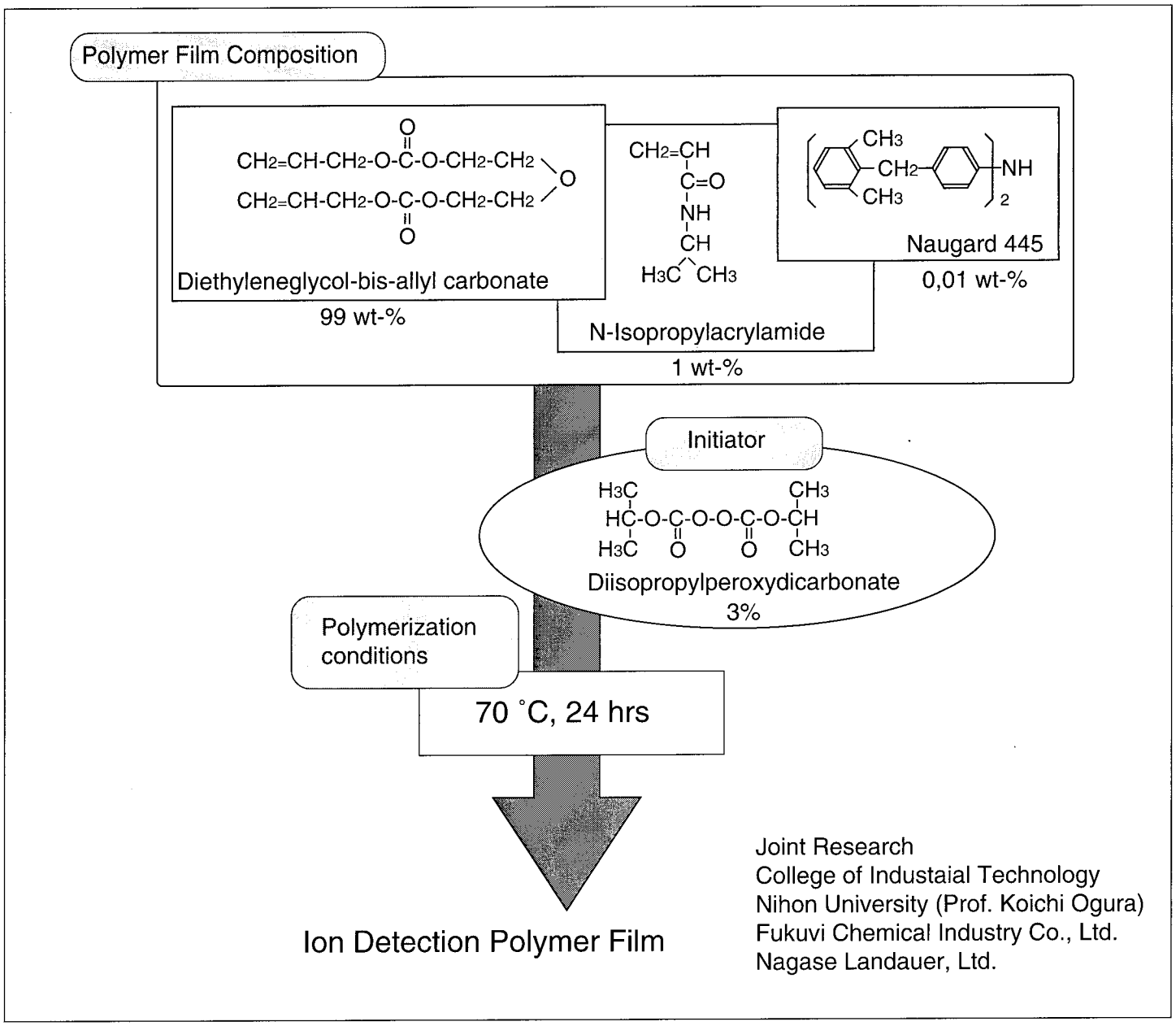


Fig. 1. Low LET Domain-Compatible Ion Detection Polymer Film

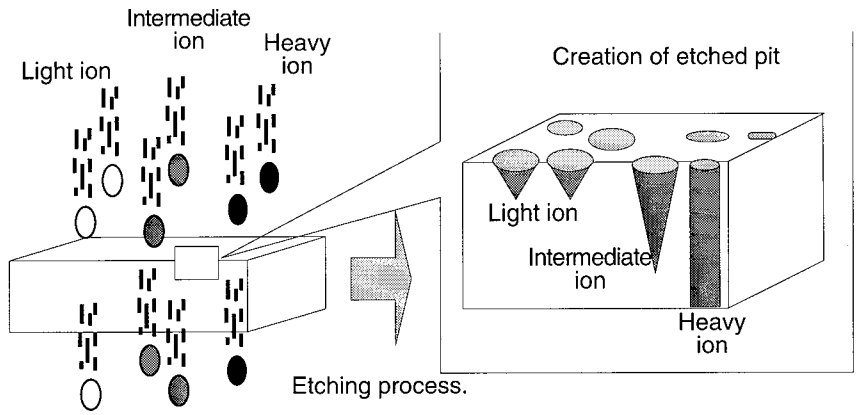


Fig. 2.

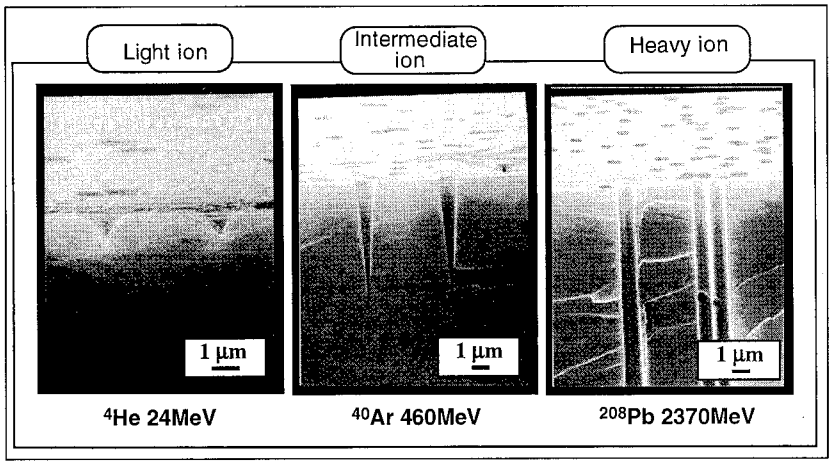
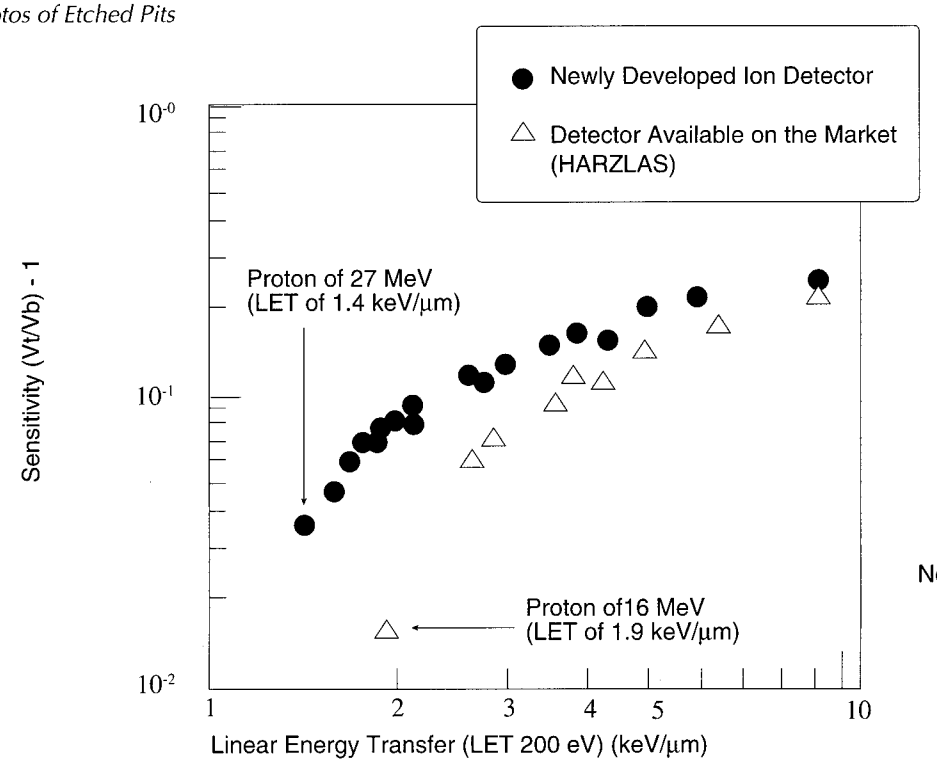


Fig. 3. Photos of Etched Pits

method of etch pit formation, and Fig. 3 photographs of the etched pits), and the film sensitivity was analyzed (Fig. 4 shows the results of sensitivity analysis). These results showed that protons of 27 MeV can be adequetly detected by linear energy transfer (LET) of 1.4. Compared with existing films available on the market, this sensitivity is about 10 times higher than low level LET ions.

Using this film increased the ion detector sensitivity by about 10 times, and it was possible to detect ions with LET of up to about 1.4 keV/μm. This is a sensitivity that greatly surpasses the existing limit (LET of 1.9 keV/μm), so the range of observations of cosmic rays is anticipated to be broadened immensely.

* ***Japan Atomic Energy Research Institute***
Department of Material Development,
Takasaki Radiation Chemistry Research Establishment
1233, Watanuki-machi, Takasaki City,
Gunma Pref. 370-1292
Tel: +81-27-346-9416
Fax: +81-27-346-9687



Note: Detection of protons of 27 MeV was confirmed far exceeding the threshold performance of existing films.
Related data were supplied by Prof. Koichi Ogura of the College of Industrial Technology, Nihon University.

Fig. 4. Film Sensitivity to Ions of Diverse Energy Levels

Electronics & Optics

98-02-002-01
Liquid Crystal Display with Ultrahigh-Speed Response

Prof. S. Kobayashi, H. Furue, Assoc. Prof. Y. Miyama and their research team of the Science University of Tokyo in Yamaguchi together with Prof. N. Koide of the Faculty of Engineering, Science University of Tokyo, Y. Iimura of the Faculty of Engineering, Tokyo University of Agriculture and Technology, together with Dainippon Ink & Chemicals, Inc. and Nissan Chemical Industries, Ltd., have jointly succeeded in establishing a new liquid crystal technology that responds to the needs of this age of cyber society (optical information network/electronic brain society = multimedia network society).

The new liquid crystal display technology, compared with conventional types of technologies, features a remarkable performance represented by an ultrahigh-speed response that is 1,000 times faster (time constant 40 μs) and a contrast ratio that is 10 times better (230/1), and has wide applications including the display of dynamic images.

Applying this new technology to computer displays as well as to television and large projectors (meter-order size) will permit color filters to be eliminated in a field sequential color display systems and to make display systems two times brighter, enable high resolution (10 μm) and new dynamic color display, as well as dynamic color stereoscopic display. In addition, new innovative technologies can be established with high-performance color navigators, optical computer systems and two-dimensional data processing techniques based on parallel processing, to meet the advanced needs of the coming age of cybernetic society.

This new technology uses a photopolymer with liquid crystal molecule side chains, by which the ferroelectric liquid crystal layer structure is stabilized. An orientation membrane (RN 1199) developed by Nissan Chemical Industries has been demonstrated to display excellent performance. Based on the development of these new materials and components, the world's first ultrahigh-speeed liquid crystal display has been developed which eliminates the zigzag defect and improves monostability.

* ***Science University of Tokyo in Yamaguchi***
1-1-1,Daigaku-dori, Onoda City,
Yamaguchi Pref.756-0884
Tel: +81-836-88-4540
Fax: +81-836-88-4540

98-02-002-02
Non-Contact Hard Disk Loading/ Unloading System

Solar Research Laboratory Ltd. has developed a Non-Contact Hard Disk Loading/Unloading System that enables hard disks to be loaded and/or unloaded into polishing machines by non-contact without damaging the disks.

This new system is an improved version of the present non-contact transfer system Float Chuck and with an added mechanism to float the hard disk from the polishing surface and to unload the disk from the polishing mat by air flow action. An air jet nozzle is equipped at the central part of four units of Float Chuck non-contact transfer systems arranged at the central part of the polishing machine. The air from the nozzle is jetted between the disk backside and the polishing mat to destroy the surface tension between the disk and the polishing mat, while at the same time, air is jetted on the hard disk surface from the surrounding Float Chucks to generate a suction force.

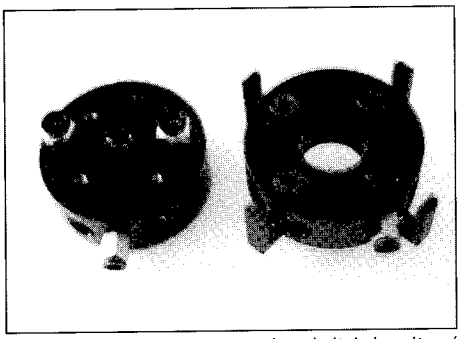
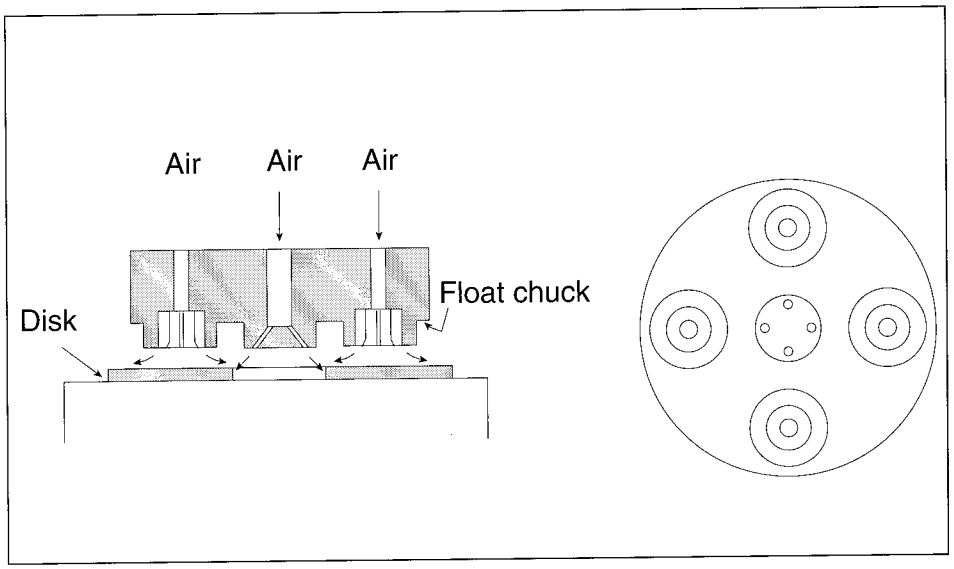


Photo of the non-contact hard disk loading/ unloading system

The hard disk is attracted to or unloaded from the polishing mat by the Non-Contact Hard Disk Loading/Unloading System, then retained in a floating state in the air to retain the non-contact state. Therefore, the hard disk is detached from the polishing mat without being scratched, covered with dust, deformed or damaged in any way.

In addition, the disk loading and unloading task is accomplished neatly and rapidly, so the production efficiency is improved and cost reduction is possible. The system for 3.5-in disks is marketed at a domestic price of ¥320,000.

* ***Solar Research Laboratory Ltd.***
1-3-1, Chokoji-Minami, Toyonaka City,
Osaka 560-0874
Tel: +81-6-862-6555
Fax: +81-6-862-6556



Non-contact hard disk loading/unloading system

98-02-002-03

Generation of Indium Gallium Nitride Dots

The Institute of Physical and Chemical Research (RIKEN) has succeeded in generating indium gallium nitride dots to serve as a blue laser light source by the newly developed technique. By using silicon organic metal as an anti-surfactant for the surface treatment of aluminum gallium nitride, indium gallium nitride quantum dots can be produced.

The Semiconductors Laboratory in RIKEN earlier established a technology to generate gallium nitride quantum dots, which are anticipated as an ultraviolet light source, by this method in the autumn of 1996. In the same way, the surface of aluminum gallium nitride formed on a silicon carbide substrate was given surface treatment with tetraethyl silane, a silicon organic metal, in the form of gasification with hydrogen. When indium gallium nitride is grown on the surface after this treatment, the surface is condensed naturally and fine dots formed on the surface. These dots had a width of 10 nm and height of 5 nm, and were small quantum dots.

Several methods are available for dot formation, but the research team utilized the characteristic that silicon addition acts as a surface active agent. The surface active agent normally improves affinity, but actually rather acted to promote the formation of dots.

Indium gallium nitride quantum dots will be utilized in a blue-laser-diode device, which is the new light source for DVD in the future.

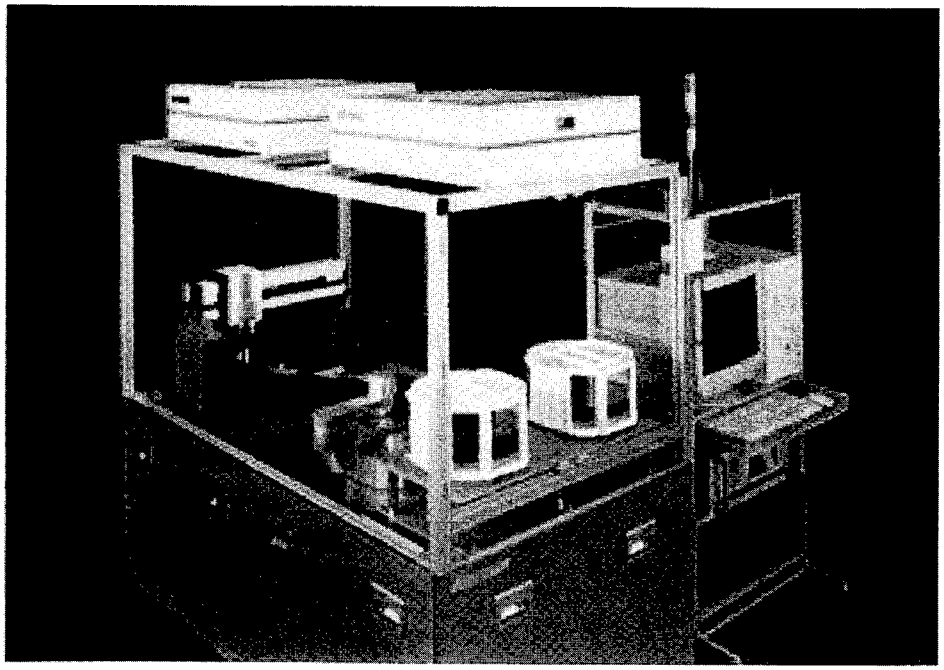
** The Institute of Physical and Chemical Research (RIKEN)*
Semiconductors Lab.
2-1, Hirosawa, Wako City, Saitama Pref. 351-0106
Tel: +81-48-462-1111
Fax: +81-48-462-4659

98-02-002-04

Profile Inspection System for Wafer Mass Production Lines

Kuroda Precision Industries Ltd. has developed a profile-inspection system for use in the mass production lines of 300 mm wafers, which are regarded as the next generation of silicon wafers.

The new inspection system Nanometro 300 PT is a vacuum- chucking type profile-inspection system that analyzes the flatness, thickness and warp of the wafers. It is a system patterned after the company Nanometro 330 F that is already being marketed and has been remodeled for specific use in wafer measurement. Wafers can be moved and mounted with a robot system. Users can choose either a rectilinear type using an X-Y table or the rotary type consisting of a rotary table and X-axis, according to their needs.



The new inspection system Nanometro 300 PT

Table 1. System Specifications

Unit outline dimension	W1,000 × D1,750 × H1,900 mm
Effective measuring area	300 mm diameter
Measuring accuracy	±0.1 μm
Repeatability	Up to 0.05 μm
Measuring head	Non-contact optical type
Min. indication unit	0.01 μm
Min. analysis data pitch	1 mm × 1 mm (after conversion into rectangular coordinates)
Max. X-axis scanning speed	30 mm/sec
Max. table rotary speed	90 rpm

Photo shows the system appearance, and Table 1 the main specifications.

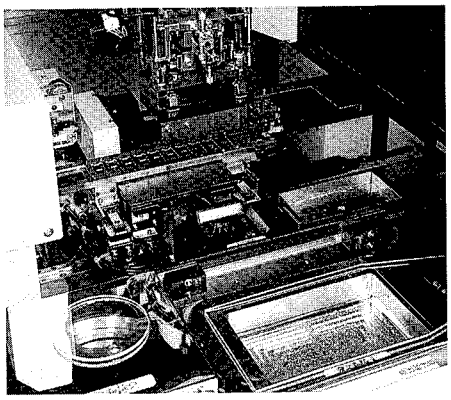
The system enables automatic cassette-to-cassette measurement, the data are filed and stored automatically, and data display and printout are possible with the ancillary computer or by using an independent computer. Another distinct feature is that the measurement results with chucks can be evaluated in the adsorbed state in the same manner as with exposure system. The system is marketed at a domestic price of ¥70 million.

**** Kuroda Precision Industries Ltd.***
239, Shimohirama, Saiwai-ku, Kawasaki City, Kanagawa Pref. 211-0953
Tel: +81-44-555-3835
Fax: +81-44-555-5825

98-02-002-05

Reliable Solder Ball Mounting System for BGA, Especially CS, Packages

Misuzu FA Corp. has developed a solder ball mounting system BA-1100 for semiconductor ball grid array (BGA) packages, especially for chip size (CS) packages.



Solder ball mounting system BA-1100

To enable rapid and accurate solder ball mounting onto chip size (CS) packages which are the miniature versions of semiconductor ball grid arrays (BGAs), the system introduces the screen printing technique featuring precision flux (activation agent) application, and an optical sensor system to check ball alignment before and after mounting. Batch mounting onto multiple packages is possible within a range of frame sizes of up to 80 × 200 mm. The diameters of the mounted solder balls are a minimum of 0.3 mm to a maximum of 1.0 mm, and ultrafine solder balls can be mounted within a positioning accuracy of ±0.05 mm in a ball pitch of minimum 0.5 mm.

The system consists of a screen printing unit, a ball alignment and mounting unit and a mounted ball inspection unit. It has an overall width of 2,370 mm, maximum depth of 1,400 mm, height of 1,750 mm, and weighs about 4,000 kg.

* ***Misuzu FA Corporation***
2970-1, Shiga, Suwa City, Nagano Pref. 392-0012
Tel +81-266-53-3369
Fax +81-266-58-1755

Machinery & Mechatronics

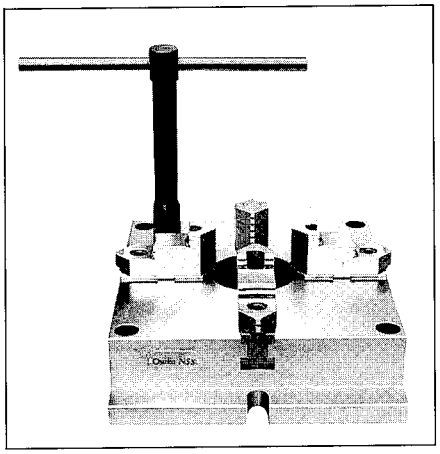
98-02-003-01

Extra-Thin Square Chucks for Machining Centers

New Strong Supply Co., Ltd. has started marketing four types of Rigid Chucks for square machining centers which retain workpieces with four claws. Virtually all types of workpieces can be set which have either round or square opposite sides, and since these chucks are square shaped, the standard values can be deduced with ease.

Th scroll type chucks can be clamped with a single clamp and, compared with a round type of the same capacity, the size is thinner by about one-third. The domestic selling price of a 6-in square chuck is ¥133,000, and that of a 12-in square chuck ¥327,000.

Key grooves are provided at two places on the bottom face to increase their parallelism with respect to the bed, and when using an original claw, the claw parallelism is 0.03 mm, and the repetitive accuracy within 0.02 mm.



Extra-thin square chucks for machining centers

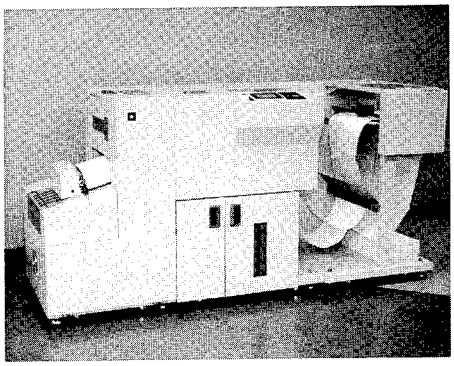
* ***New Strong Supply Co., Ltd.***
2-14-6, Ohmiya-dohri, Moriguchi City, Osaka 570-0033
Tel: +81-6-998-5235
Fax: +81-6-992-2655

98-02-003-02

Bookbinding Machine Using Paste Instead of Staples

Toppan Forms Co., Ltd. has started marketing a high-speed bookbinding machine, Confia 7610, that uses paste for binding various kinds of tax payment slips pads and receipt pads. The machine features a much faster binding speed that is three times that of the conventional type of staple binding machine using metal wire.

Confia 7610 uses paste for binding, which enables the paper binding work to be accomplished without interruption, and the binding of 200 pads per minute is possible at a rate of 61 m/min for six-sheet binding. The entire series of operations, including the cutting, pasting, stacking and cutting off the edges of continuous forms printed with data and marks, can be accomplished at a high speed. Paste binding protects the user from injury and also increases the binding volume (up to 50 sheets, or double the volume compared with staple binding).



High-speed bookbinding machine

The preparation of various types of pads consisting of tax payment slips together with receipts for use by regional autonomous entities have to be prepared rapidly within a short period of time, and the newly developed bookbinding machine is expected to be suitable for these purposes.

The new machine is marketed at a domestic price of ¥11 million. The machine has a length of 2,084 mm, width of 802 mm, height of 1,050 mm and weighs 450 kg.

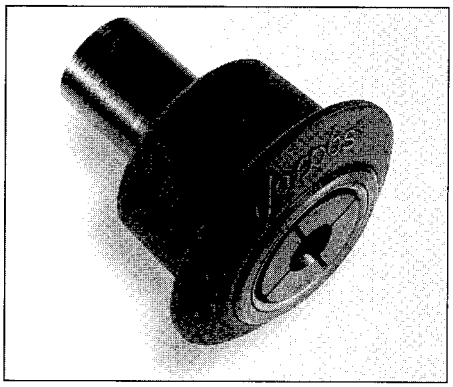
* ***Toppan Forms Co., Ltd.***
1-6, Kanda Surugadai, Chiyoda-ku, Tokyo 101-0062
Tel: +81-3-3259-2485
Fax: +81-3-3293-2729

98-02-003-03

Router Chuck Changeable Without Tools

Jacobs Japan Inc. has marketed a toolless router chuck Hand-Tite Router Chuck that enables bits to be changed rapidly without using any tool. Simply working a lever situated near the collet with a single hand enables a bit to be installed or released with ease in seconds. In addition to routers, this mechanism can be applied to hand reamers, die grinders and rotary cutters.

Up till now, when changing the blade bits of the routers used in woodworking relief work, both hands had to be used to work two wrenches, one for collet fixation and the other for box nut clamping or loosening. Therefore, working at narrow places had been difficult, required much time, and the wrench frequently got lost. With the new toolless router chuck, a wear-resisting precision bearing is incorporated, and simply pressing a lever enables the collet to be engaged to fix the bit securely into its prescribed position, and drawing the level enables the collet to be loosened and taken out.



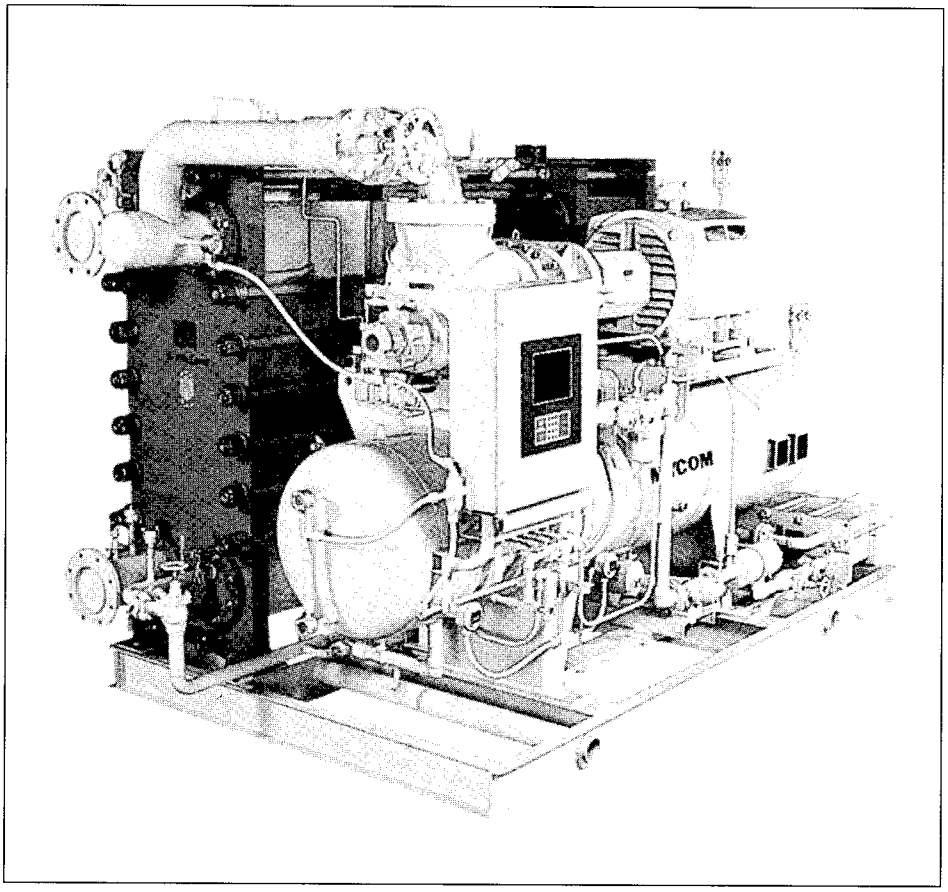
Hand-Tite Router Chuck

* ***Jacobs Japan Inc.***
2-19-2, Daijuji, Okazaki City, Aichi Pref. 444-2134
Tel: +81-564-26-0620
Fax: +81-564-26-0626

98-02-003-04

Screw Compressor Dry Refrigeration System Using NWF; Ammonia As Refrigerant

Mayekawa Mfg. Co., Ltd. has developed a series of screw compressor dry refrigeration systems available in the MNDC series in which the refrigerant has been changed from fluon gas to Natural Working Fluid ammonia. Therefore, these refrigeration systems feature zero Ozone Depletion Potential and zero Globe Warming Potential.



Screw compressor dry refrigeration system using ammonia as refrigerant

This series of refrigeration systems has been made compact and substantially safe due to the development of a direct expansion vaporization system using an oil that dissolves readily in ammonia and which minimizes the volume of use of refrigerant (ammonia), by which the necessary refrigerant charge is reduced to one-fifieth compared with the present liquid pump type cooling systems.

In addition, these systems use an electronic expansion valve the company developed to adjust the refrigerant flow to an optimum rate, and a high-performance plate type heat exchanger in the vaporization and coagulation units, by which a high efficiency is displayed. Further, a low-temperature heat storage unit of simple design is used that enables the cooling water temperature to be raised in 1 °C steps.

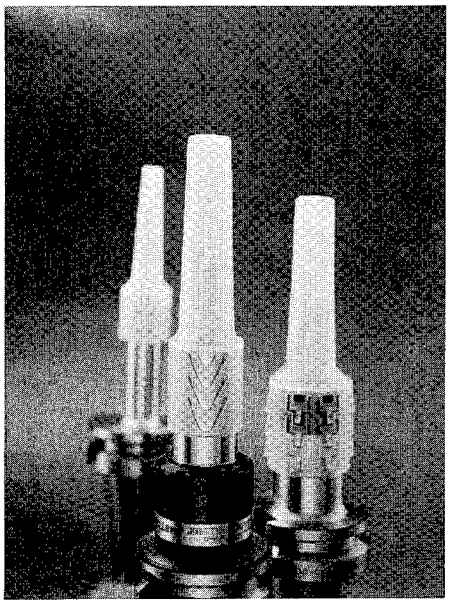
* ***Mayekawa Mfg. Co., Ltd.***
2-13-1, Botan, Koto-Ku, Tokyo 135-8482
Tel: +81-3-3642-8181
Fax: +81-3-3643-7094

98-02-003-05

Convenient Tool Blade Protective Cover

MST Corp. has started marketing three types of convenient cutting tool blade covers Tool Cap which can be engaged or disengaged by fingertip action. These blade protective covers are used to safeguard workers and to prevent blade damage when conveying tools from one place to another.

Tool Cap is used to cover tool holders, and since they do not exert any direct force on the tool blades, the blades are not damaged in any way. Also, since they are made of translucent plastic, the tools can be inspected with ease. In addition, these covers do not fall off even when the tools are turned upside down, so they offer reliable tool protection and help to improve work efficiency substantially.



Convenient tool blade protective cover

These covers are available in three models depending on the diameter of the nut of the tool holder. One is for a nut diameter of 20-22 mm, another is for a nut diameter of 28-30 mm, and the other for a nut diameter of 34-36 mm.

* ***MST Corporation***
1738, Kitatahara, Ikoma, Nara Pref. 630-0142
Tel: +81-743-78-1184
Fax: +81-743-78-3854

98-02-003-06

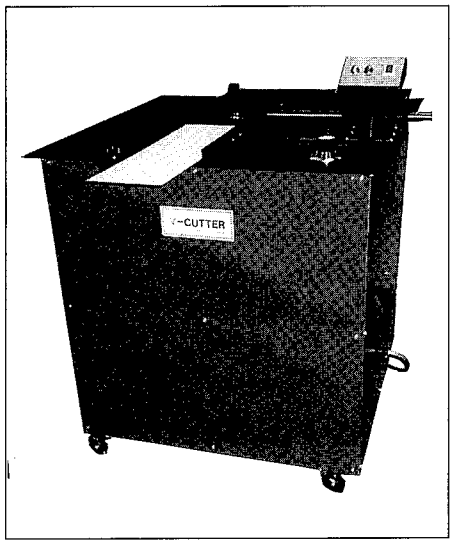
Portable Metal V-Grooving Machine

Fukoku Corp. has marketed a V-Cutter series of portable metal V-grooving machines available in four models. These machines are designed to provide bending grooves with groove-cutting blades before using stainless steel plates in the process of constructing housing units. When bending stainless steel plates with press bending machines, the plates are frequently seisured after pressing by press brake, but using the new metal V-grooving machines enables plate bending neatly, with ease and without press brake seisure. These machines are sold at domestic prices from ¥950,000 to ¥1,980,000 depending on their specifications.

These V-grooving machines can work with metal plates regardless of their lengths. The smallest Model 150 Machine can work with metal plates with breadths of 15-150 mm, and the largest Model 750 with metal plates with breadths of 6-750 m/m. All models can working with metal plates with thicknesses from 0.5 to 1.5 mm.

Specification of V-Grooving Machine

Type	150-type	2000X	2000DX	750-type
Processing width	15 - 150 mm	Free	Free	Free
Grooving position				
(From metal sheet end)	Free	6 - 200 mm	6 - 200 mm	6 - 750 mm
Metal sheet length	Free	Free	Free	Free
Grooving direction	Horizontal	vertical	Horizontal /Vertical	Vertical
Plate thickness	0.5 - 1.5 00	0.5 - 3.0 mm	0.5 - 3.0 mm	0.5 - 3.0 mm
Power source	AC100V	AC100V	AC100V	AC100V
Machine Dimension				
(HeightxWidexDeep) (mm)	1050x670x570	1050x770x770	1050x770x770	1050x750x900
Weight (kg)	70	70	70	150
Application	For channel characters	For building metal sheet processing	For building metal sheet processing	For large scale building metal sheet processing



Portable metal V-grooving machine

The grooving blades of all these models can be replaced at a cost of about ¥30,000. The Model 150 Machine has a breadth of 670 mm, depth of 570 mm, height of 1,050 mm and weighs 70 kg. The rated power of the Model 150 Machine is 200 W.

* ***Fukoku Corp.***
5-5, 2-chome, Shin-Yokohama, Kohoku-ku, Yokohama-City, Kanagawa Pref.222-0033
Tel: +81-45-473-3391
Fax: +81-45-472-2739

98-02-003-07

World's First Large Water Discharge Pump Station Using L Shaped Gas Turbine

Kubota Corp. and Kawasaki Heavy Industries, Ltd. have jointly developed the world's first large water discharge pump station using an L shaped gas turbine LGT-01 which is designed to prevent floods caused by typhoons and torrential downpours.

As a recent trend, water discharge pump facilities are becoming ever larger and serving wider areas to prevent floods caused by typhoons and local torrential downpours, making cost reduction a major concern when constructing these facilities. Also, since problems to these facilities culminate in enormous regional damage, securing the reliabilities of these facilities has become a critical social demand. Therefore, the prime movers to drive these large-capacity pumps are gas turbines of high reliability, and research is in progress to design gas turbines of ever compact sizes in order to reduce facility installation spaces.

The large water discharge pump facility was developed by the two companies. Kubota was in charge of overall engineering and Kawasaki Heavy Industries developed the L shaped gas turbine LGT-01 with the output axis faced directly downward for the world's first time. The pump

facility ground space is influenced by the size of the prime mover, but due to the introduction of the L shaped gas turbine, the gas turbine can be installed on the upper part of the underground pump. With the same output, the housing area of the pump facility is reduced by about 40% compared with that of the conventional type of horizontal axis gas turbine pump facility. Also, the underground space that is influenced by the size of the pump and waterway has also been decreased by increasing the speeds of the pump and the waterway.

The L shaped gas turbine LGT-01 developed successfully for the world's first time has a maximum output of 15,000 HP class and can drive a pump with a water discharging capacity of 50-100 m^3/s, the country's largest. Also, the turbine is based on the aero-derivative gas turbine backed by a fine record of performance as a land and marine use, and therefore has a construction displaying excellent performance and reliability. The application of this L shaped gas turbine to the water discharge pump facility eliminates the need for a bevel gear type reduction gear system that is indispensable with the conventional horizontal axle gas turbine for use as a vertical type drive axle, which enables considerable reduction of installation space and gear noise. In addition, the L shaped gas turbine introduces the digital fuel control system, so features excellent operability and maintenance. The companies plan to cooperate in business activities delivering the large water discharge pump station to large pumping stations to be constructed in the future. (Revised from the previous issue)

* ***Kubota Corporation***
Public Affairs Office
1-2-47, Shikitsu-Higashi, Naniwa-ku,
Osaka 556-0012
Tel: +81-6-648-2388
Fax: +81-6-648-2398

* ***Kawasaki Heavy Industries, Ltd.***
Public Relations Dept.
1-4-1, Hamamatsu-cho, Minato-Ku, Tokyo
105-0013
Tel: +81-3-3435-2131
Fax: +81-3432-4759

Information & Communications

98-02-004-01

M-I-M Active Matrix Renovated and Marketed as D-TFD Active Matrix Liquid Crystal

Seiko-Epson Corpo. has completely renovated the conventional type of metal-insulator-metal (MIM) active matrix liquid crystal into a digital thin-film diode (D-TFD) active matrix liquid crystal and started distributing samples of the new liquid crystal from December last year. It is available in the 2.0 type LB20HR-BC00 and the 2.8 type LB28MC-BC00 versions.

Compared with conventional counterparts, the pixel density has been increased by 1.5 times and the surface brightness by 2.0 times, whereas power consumption has been decreased by 10%. Also, the background light is provided by the side lighting system, so the configuration is as thin as 8.5-11.2 mm. The resolution is 481 × 234 dots, and the company is marketing the new D-TFD active matrix liquid crystal for use in digital still cameras, camcoders and various types of monitors.

D-TFD liquid crystal is based on the digital thin-film diode configuration and, in contrast to the analog configuration, the entire circuitry including its interface are digitalized, so power conservation is performed with ease. Also, since the element is small, its aperture ratio is high and enables precision imaging better than its thin-film transistor counterparts. The company had been using the term MIM from the stage of the new liquid crystal development, but renamed it D-TFD for differentiation from the conventional TFT liquid crystal.

* ***Seiko Epson Corporation***
421-8, Hino, Hino City, Tokyo 191-8501
Tel: +81-42-587-7665
Fax: +81-42-587-5652

Process & Production Engineering

98-02-005-01
Powder Vacuum Compression Scaling and Packaging Machine

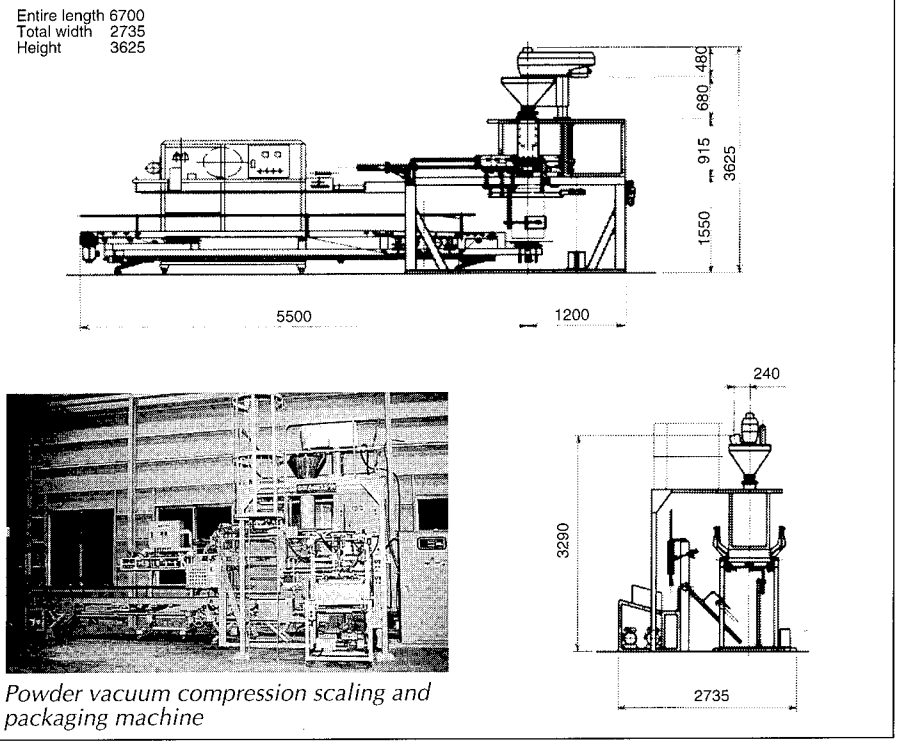
Nagasaki Kiki MFG. Co., Ltd. has started marketing a newly developed fully automated powder packaging machine called Powder Vacuum Compression Scaling and Packaging Machine. A special type of filter is used, by which all the processes of degassing into vacuum state, auger (screw) compression, automatic scaling and packaging are integrated into a single process to enable substantial labor conservation and environmental improvement in packaging operations. The machine is marketed at a domestic price of about ¥35 million.

The machine was developed jointly with Mitsubishi Chemical Engineering Corp. and Technica Co., Ltd. It consists of a internal tube (filtration) unit and an external tube (vacuum chamber) unit. The internal tube unit, in particular, is distinct in that it consists of a metal filter and a porous metal plate. In the degassing process, the powder air is sucked out in the vacuum chamber while transferring the treated powder with an auger system. In the process, only the air between the powder grains are removed continuously by means of a special type of filler inside the inner tube without discharging any powder grain.

The degassing and auger compression mechanism by the newly developed vacuum degassing unit, the powder bulk density can be increased by 1.2-4.4 times compared with before, and the package size can also be made smaller.

Another advantage is that the powder dust is decreased considerably, so that the working environment is improved substantially. The machine is applicable to processing pharmaceuticals, agricultural chemicals, wheat and other powdery substances. The treatment capacity is 300 packages/hr when working with packages containing 15-25 kg of powder.

* ***Nagasaki Kiki MFG. Co., Ltd.***
Marketing Dept.
820, Motomurago, Togitsu-cho,
Nishisonogi-gun, Nagasaki Pref. 851-2103
Tel: +81-95-882-2411
Fax: +81-95-882-3173



Powder vacuum compression scaling and packaging machine

98-02-005-02
Rack Type Ultracompact Rotary Actuator

Kondo Seisakusho Co., Ltd. has marketed a rack type ultracompact rotary actuator Mecharotor. It is available in 8 models with cylinder diameters of 16, 20, 25 and 30 mm and speeds of 90 and 180 rpm. They are sold at a domestic price of ¥28,800-38,800.

Mecharotor is mounted on the transfer systems of production lines. Conventional types were of large sizes, and the vane type that was designed compact used to have the disadvantage of air leakage due to rubber wearing. Mecharotor with minimal air leakage has been downsized by about 40% compared with its conventional counterparts, so is now available in a compact size almost comparable to that of vane type rotary actuators. Due to the light weight and high performance, it can be fitted with ease and conveniently on the actuating parts of various types of machines.

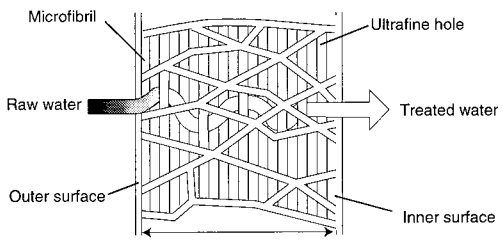
* ***Kondo Seisakusho Co., Ltd.***
Public Relations Dept.
11-1, Itpongi, Fukamizo, Kouta-cho,
Nukata-gun, Aichi Pref. 444-0124
Tel: +81-564-62-0428
Fax: +81-564-62-6614

98-02-005-03
Saltwater and Freshwater Purification System

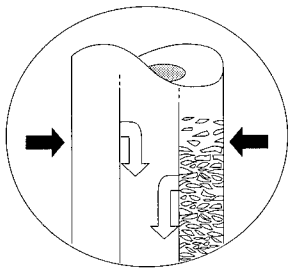
Ishikawajima-Shibaura Machinery Co., Ltd. has started taking orders for a newly developed Saltwater and Freshwater Purification System that can filter and sterilize natural saltwater for complete sterile salt water. This is the first case of mass production of a system capable of treating both seawater and fresh water in Japan.

The system uses an ultrafine hollow filtration membrane (made of polyethylene) and features a fractionation capacity of 0.1 μm, by which E. coli such as the pathological bacterium 0157, as well as protozoans such as cryptosporidium, which cannot be terminated with chlorine, are removed completely.

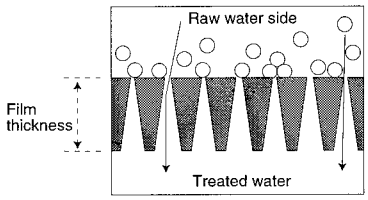
A myriad of ultrafine holes are formed on the surfaces of a tubular hollow film assembly. The liquid penetrates from the outer surface and must pass through the ultrafine pores to reach the inner surface. The ultrafine pores are linked together in



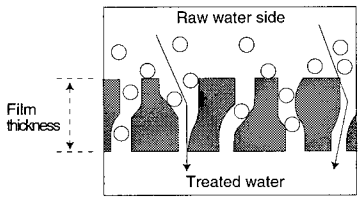
Filtration mechnism of hollow film



Outin type filtration



New type surface filtration



Conventional type internal filtration

the filter wall and act as a sieve to obstruct the passage of foreign substances such as large floating particles. In the process of filtration, the foreign substances in the water and accumulations on the hollow film assembly are temporarily removed by counterflow of the treated water. At the same time, air bubbling is performed with a blower from the underside, the film oscillated by the bubbles rises in the water, and the foreign substances are exfoliated and removed. Therefore, the volume of water to clean the film is minimized.

The system is lightweight and compact, the filtration pressure is low due to filtration with the hollow film assembly, and since the system is designed simple, it is operated with minimal power. In addition, it is operable automatically with just pushbutton action and is therefore a labor-saving system. The film assembly is made of polyethylene with rugged durability, and withstands long use for about five years.

The system is compatible with the Hazard Analysis Concentrated Control Policy (HACCP) and the FY 1998 Version Food Sanitation Act (regarding the handling of fisheries products exported to EU countries) about which the food processing industry is much concerned. Therefore, the new system, removing floating substances and bacteria in seawater and enabling purified water to be used in all processes of defreezing and washing, contributes immensely to improving the quality standards and to retain the freshness of fishery products. Also, by using bacteria-free water for fish culturing, the hatching ratio and survival rate of frys are improved considerably, while the water used for defreezing, washing, cooling and processing by food processing plants can be recycled.

The Model SMB-15 System, the standard system for seawater purification with a processing capacity of 1 t/hr, is marketed at a domestic price of ¥8 million, the Model SMB-25 System (capacity 2 t/hr) at a price of ¥9,500,000, and the Model SMB-55 System (capacity 5 t/hr) at a price of ¥15 million.

* ***Ishikawajima-Shibaura Machinery Co., Ltd.***
Research Development Div.
5-32-7, Sendagaya, Shibuya-ku, Tokyo 151-0051
Tel: +81-3-3358-4211
Fax: +81-3-3358-4223

98-02-005-04

Ultracompact and Lightweight Laser Line Marker

Line Seiki Co., Ltd. has marketed an ultracompact and lightweight laser line marker Pocket Kun (Master Pocket) that can be placed conveniently in the pocket of the worker using the device. Pocket Kun is designed for use indoors by technicians engaged in interior decoration, electric wiring, air conditioning and facility installation works, and it is sold at a domestic price of ¥ 98,000.

Pocket Kun is 38 × 86 × 120 mm and weighs 350 g. The light source is a visible ray semiconductor laser beam with a wavelength of 635 nm, and can be operated continuously for 20 hrs with four UM3 alkaline batteries. It is based on the magnetic control system and line marking is performed quickly. In addition, the use of optical glass at the laser irradiation orifice makes the line marker highly resistant to dust.

When used as a laser-based ink marker for interior decoration work, for example, the beam irradiation angle is very wide at over 280 degrees, so the irradiation angle encompasses the entire domain from both walls to the ceiling and floor to enable a wide range of irradiation. The laser beam is corrected automatically and set for vertical marking, so by using two line markers when engaging in 'vertical marking' that is indispensable in interior decoration work, the marking of lines from the floor to the ceiling can be performed by a single worker.

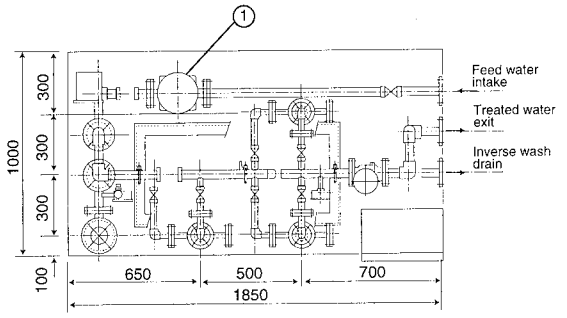
* ***Line Seiki Co., Ltd.***
2-37-7, Chuo-cho, Meguro-ku, Tokyo 152-0001
Tel: +81-3-3726-5151
Fax: +81-3-3710-4552

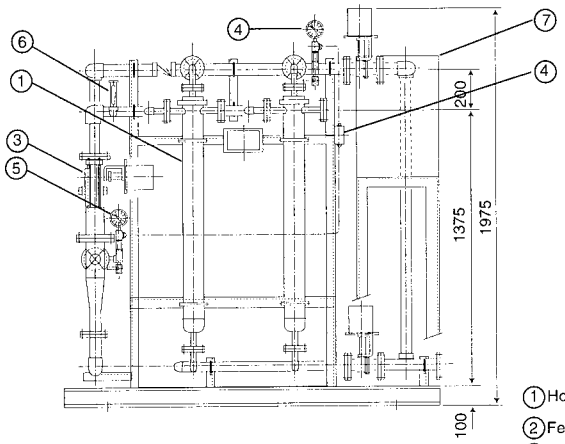
98-02-005-05

Continuous Filtration System for 99 °C Hot Water

Kuraray Co., Ltd. and Naigai Co., Ltd. have jointly commercialized a hot water filtration system to remove ultrafine ferrous particles from hot water such as steam drains. A newly developed heat-resistant membrane enables long-term filtration of hot water at temperatures several dozens higher than before. Therefore, using this filtration system permits substantial energy

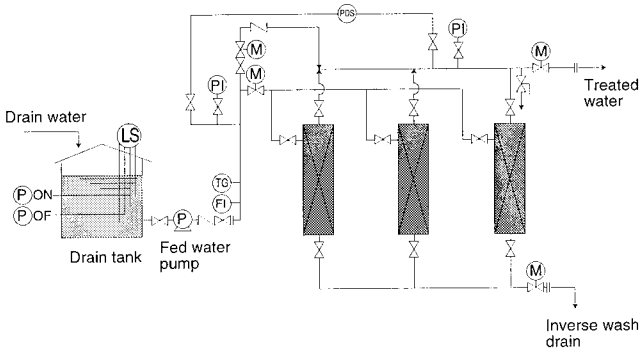
NKUF-30HA-A type outline drawing



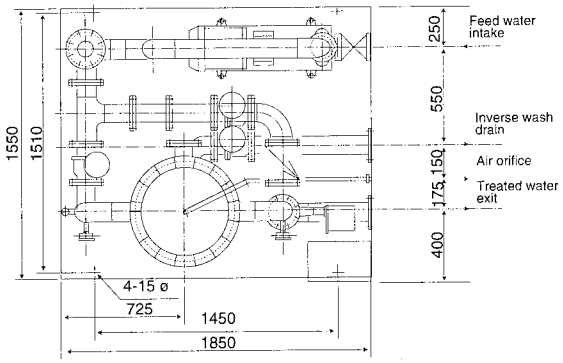


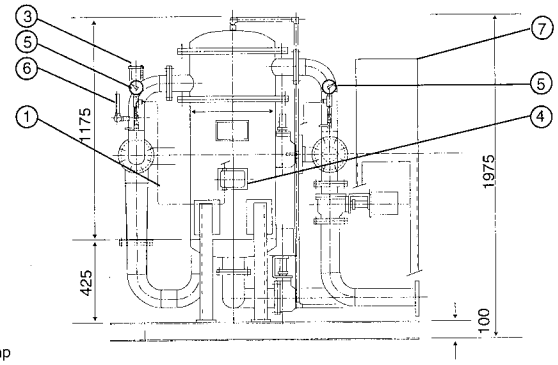
① Housing
② Feed water pump
③ Flow meter
④ Pressure switch
⑤ Manometer
⑥ Temperarure gauge
⑦ Control panel

Flow sheet

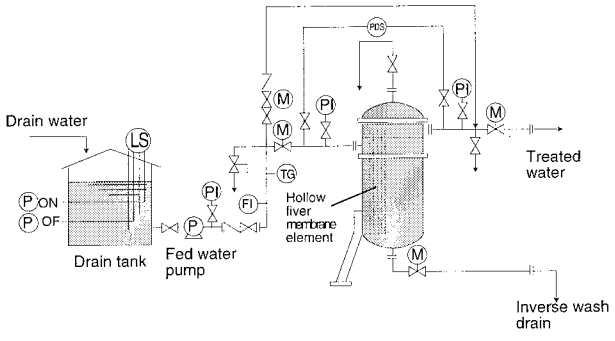


NKUF-140TA-A type outline drawing





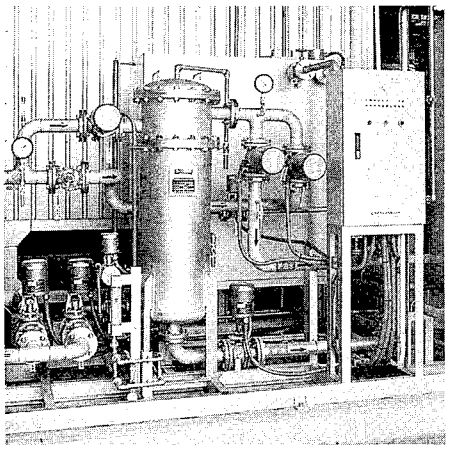
Flow sheet



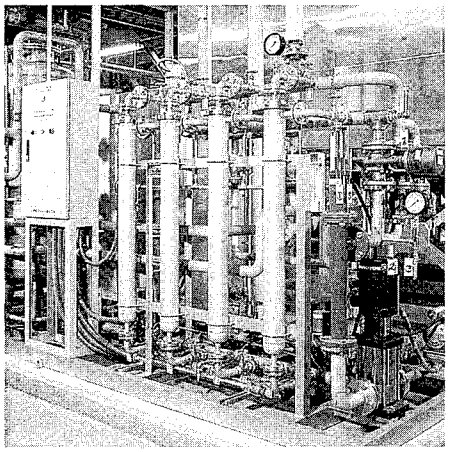
conservation when reheating used hot water with a boiler. The new system was placed on the market in January, 1998.

The system consists of a feed water pump, a filtration module, piping-valves and measuring instruments, all mounted on a common bed. The steam generated with a boiler and used for interior air conditioning is recycled to the steam drain as hot water through the pipings, so when recovering and reutilizing the used hot water, it will be necessary to remove the ultrafine ferrous rust generated by the pipings to prevent boiler damage.

The membranes of conventional types of filtration systems cannot resist intense heat, so the hot water has to be cooled by adding cold water. The newly developed filtration system consists of a hollow precision hollow fiber membrane made of polysulphide, with the hollow membrane elements and housing designed with heat-resistant specifications, so that hot water at up to 99 °C can be filtered. The conventional type of drain filter made of cotton has a filtration limit of 1 μm, but the new drain filter features an limit of 0.1-0.005 μm, or a filtration limit that is 10-200 times greater compared with before. In addition, a mechanism is provided that automatically washes off the ferrous particles adhering on the membrane, so the filtration system is usable continuously over a long time.



NKUF-70 TA-C type



NKUF-40HA-C type

According to the data obtained through the tests conducted by the two companies, the filtration system was usable without problems for two years when used 24-hrs daily to treat 15 t/hr of used hot water, and the running cost was slashed by ¥20 million annually in fuel and water costs.

The unit was developed by Kuraray, and the overall system assembly designed by Naigai. The system will be marketed by both these companies via their sales networks.

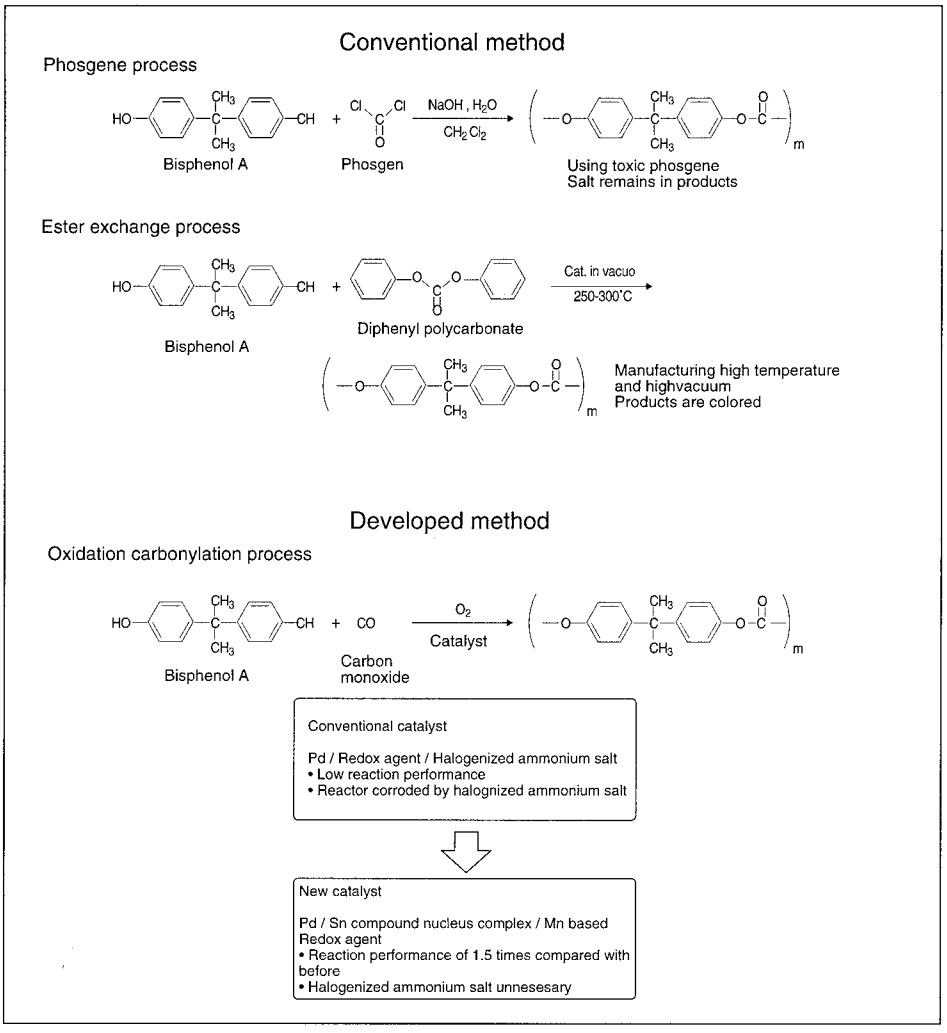
* ***Naigai Co., Ltd.***
Public Relations Dept.
5-12-2, Minami-Ohi, Shinagawa-ku, Tokyo 140-0013
Tel: +81-3-3762-2441
Fax: +81-3-3764-1767

98-02-005-06
Polycarbonate Manufactured Using No Toxic Phosgene

The Joint Research Center for Precision Polymerization, of the National Institute of Materials and Chemical Research of the Agency of Industrial Science and Technology and the Japan High Polymer Center, has established a new process to synthesize polycarbonate without using the toxic phosgene. The research team investigated a new catalytic system consisting of a palladium(Pd)-tin(Sn) binuclear complex and a manganese(Mn)-based redox agent (for in situ regeneration of the catalyst). The catalyst is confirmed to process catalytic activity for diphenyl carbonate synthesis 1.5 times higher than that of reported catalyst. By further improving the activity of this novel to develop catalyst and utilizing it in polymer synthesis, it will become possible new, entirely harmless polycarbonate manufacturing processes.

Aromatic polycarbonate is a transparent, incombustible thermoplastic featuring excellent heat resistance and aging resistance, and is used, for example, to manufacture compact disks (CDs). Aromatic polycarbonate is manufactured primarily by polycondensation of phosgene and bisphenol A, or by ester exchange reaction of diphenyl polycarbonate and bisphenol A at over 250 °C. The phosgene process is toxic and salt remains in the formed polymer, while the ester exchange process involves a high temperature and the polycarbonate is colored, so both these processes demand improvements.

An alternative process that is under study in various countries is the oxidation carbonylation process using carbon monoxide in place of phosgene, and palladium as the catalyst. However, the development of a highly active and selective catalyst for reacting bisphenol A with carbon monoxide and oxygen (for catalyst regeneration) in an environment of mixed gases is the key to the establishment of the process. Pd is the main component of catalyst system, to which various types of additives are added for improving the catalytic activity and selectivity. Various types of redox agents for catalyst regeneration and bases for activat-



Newly developed polycarbonate manufacturing

ing the raw material bisphenol A are also used as the additive, but at present, the reaction performance is rather low. Also, the commonly used basic ammonium halide posses a problem of salt generation which leads to corrosion of the reactor.

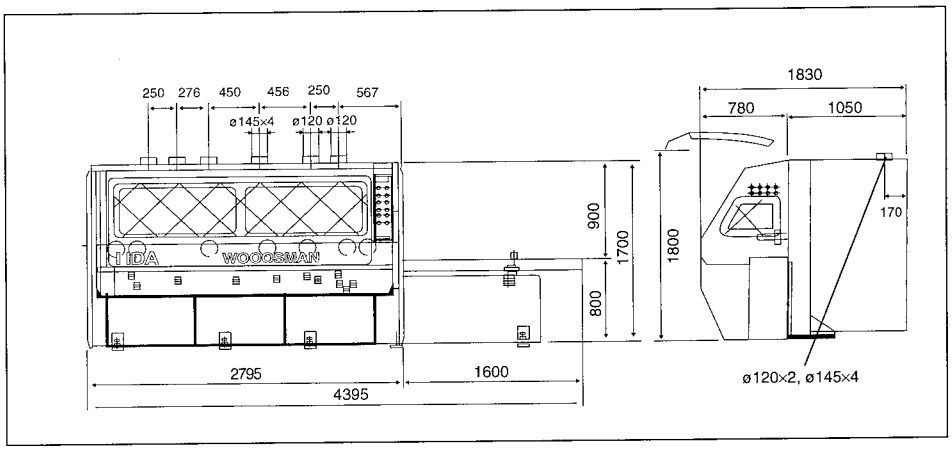
The research institute directed its attention on Sn salt that has Lewis acidity and established a new catalyst system consisting of a Pd-Sn binuclear complex along with Mn-based redox agent. This catalyst system was confirmed to be capable of working in the absence of ammonium halide, and showed a high reactivity in the synthesis of diphenyl carbonate from phenol that is the model reaction for the synthesis of aromatic polycarbonate. Reactivity of this new catalyst was about 1.5 times higher than that of conventional catalysts using ammonium halide. Also this catalyst worked efficiently under mild conditions of carbon monoxide pressure of 0.5 Mpa (5 atmospheric pressure), oxygen pressure of 0.25 MPa (2.5 atmospheric pressure) and a temperature of 100 °C. By further improving the activity of this new catalyst, and expanding its applicability to polymer synthesis, the research team expects to develop a new non-toxic manufacturing process for polycarbonates.

This research work is a part of the Technology for Novel High-Functional Materials Project being advanced under the Industrial Science and Technology Frontier Program implemented by the Agency of Industrial Science and Technology.

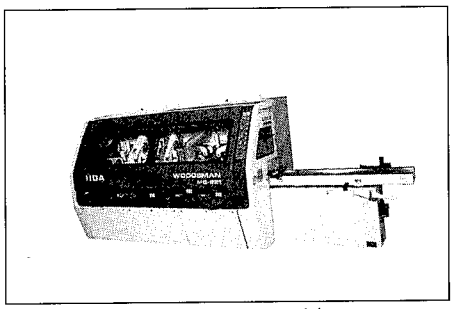
* ***National Institute of Materials and Chemical Research, AIST***
1-1, Higashi, Tsukuba, Ibaraki Pref. 305-8565
Tel: +81-298-54-6348
Fax: +81-298-54-6327

98-02-005-07
Versatile Type Six-Spindle Molder

Iida Woodworking Machinery has started marketing a low-priced versatile type six-spindle molder Woodsman MC-221 which incorporates advanced functions based on the functions of the more advanced molder Woodsman M-223, but the selling price has been lowered considerably through parts standardization and design optimization. It is sold at a domestic price of ¥8,900,000 (cutting tools not included).



Dimensional drawing



Versatile type six-spindle molder Woodsman MC-221

Compared with the five-axes molder in wide use previously as a versatile type molder, Woodsman MC-221 enables a broader scope of woodworking operations to be performed due to its six-spindle design, but its price is comparable to that of a five-axes molder. Also, since its functions are based on those of more advanced types, it produces products of excellent quality.

The feed mechanism of the independent drive unit provides optimum speeds due to inverter control, and the maintenance-free feed drive mechanism, the belt used commonly for all axes and the centralized oil feeding mechanism, all combine to minimize the time required for maintenance. Mechanical-digital display units are provided as standard equipment for axis-shifting as well as for working the chip breaker and pressure, and a large safety cover is also equipped.

In addition to these advanced features, the new molder features low-noise operation due to a soundproof mechanism, and its operability has been increased by installing the manipulation panel at the front part of the molder. The molder maximum working size is up to a width of 220 mm and thickness of 125 mm.

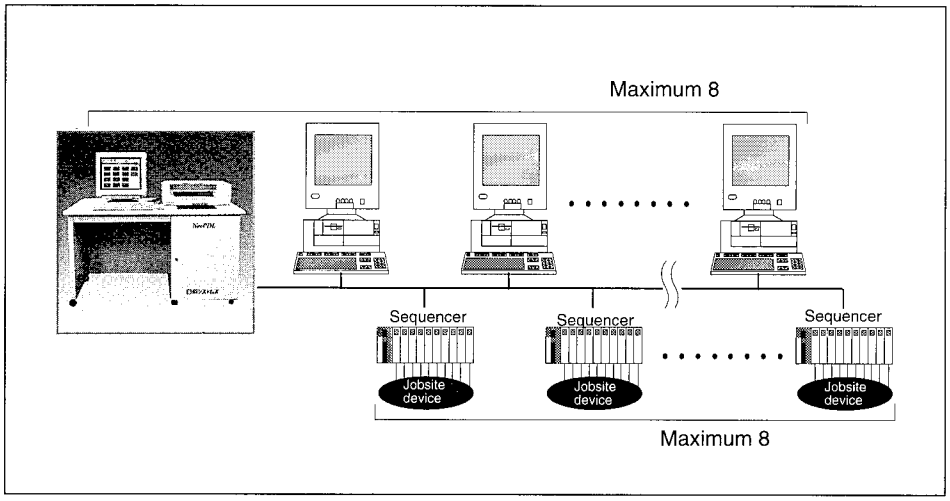
* ***Iida Woodworking Machinery***
Public Relations Dept.
153, Muranaka, Komaki City, Aicvhi Pref. 485-0082
Tel: +81-568-75-5321
Fax: +81-568-75-5329

98-02-005-08
High-Performance System for Monitoring and Controlling Diverse Industrial Plant Facilities

Nissin Systems Co., Ltd. has marketed a high-performance NeoPDL V2 System for monitoring and controlling various industrial plant facilities such as electric power generation facilities, water supply and sewage systems facilities and incineration plant facilities. The distributed type instrumentation monitoring and control system performs plant facility monitoring and control by simple manipulation with a graphical panel, and the various data collected through slip and ledger administration can be edited and printed out. A maximum of 1,500 essential points can be monitored and controlled.

The system main functions are a graphical monitoring and control function, a message listing function, an alarm listing function, a ledger administration function, a trend graph display function, a system maintenance function and a power demand monitoring function.

As the system data correction function whenever some problem occurs, a data recovery function performs back-up with slip and ledger data in connection with the preceding day and the day concerned, while the network function has been substantiated to permit personal computer linkage



System block diagram

to a maximum of eight monitoring centers, so that the various monitoring and control functions can be accomplished in distribution and through mutual back-up even from remote centers.

The system features a broad degree of openness due to its compatibility with DOS/V and Windows NT. The basic software package is sold at a domestic price of ¥2 million, and a system with 300 monitoring points at a price of about ¥7 million.

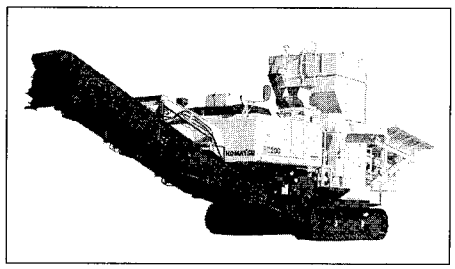
* ***Nissin Systems Co., Ltd.***
Public Relations Dept.
293-1, Ayahorikawa-cho, Horikawa-dori, Ayano-koji Sagaru, Shimogyo-ku, Kyoto City, Kyoto 600-8482
Tel: +81-75-344-7880
Fax: +81-75-344-7887
URL: http://www. co-nss. co. jp
E-mail: webmaster@co-nss.co.jp

Construction & Transportation

98-02-006-01 Mobile Soil Stabilizer with Soil Cutter

Komatsu Ltd. has started accepting orders for a newly developed mobile soil stabilizer BZ200 that is equipped with a soil cutter as its standard accessory. This is the world's first soil stabilizer equipped with a soil cutter and can improve soil by digging up and mixing clayey lumps of soil, a task that had been difficult with conventional types of machines. It is marketed at a domestic price of ¥39 million.

Compared with present models, this new model has a maximum treatment capacity of 40-80 m^3/hr, or a capacity that is 2.5 to 5 times greater, and almost comparable to that of a compact stationary type soil improvement plant that is in wide use today. The machine main part is compact, its soil mixing performance is excellent, and its mobility is highly compatible with all kinds of existing soil conditions, so considerably reduces the soil treatment cost, the need for procuring improved soil and the operating cost.



Soil stabilizer BZ200

With the stationary type soil improvement plant, the soil has to be conveyed from the construction site to the machine installation. In contrast, with the new mobile machine, it is only necessary to transport the treated soil to the construction site with 20-t trailers.

The soil dug up at construction sites is improved to enable use for refilling, and for improving flimsy foundation soil. In foundation soil improvement, the common method is to spray a solidification agent and to agitate the soil with a hydraulic shovel. Using the new soil improvement machine enables soil improvement through a uniform mixture of solidification agent, and there is also the advantage that dust generation by solidification agent mixing is prevented.

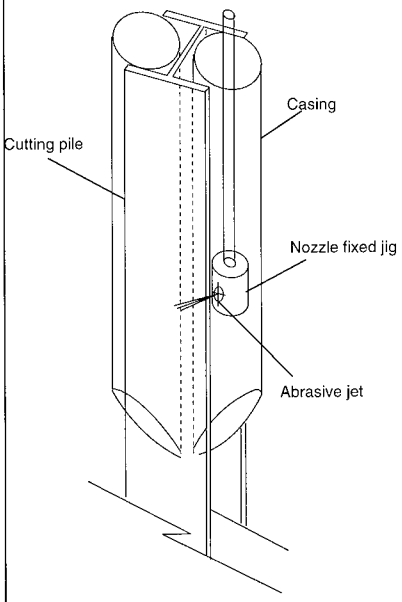
* ***Komatsu Ltd.***
Public Relations Dept.
2-3-6, Akasaka, Minato-ku, Tokyo 107-8414
Tel: +81-3-5561-2616
Fax: +81-3-3505-9662

98-02-006-02 Existing H-Steel Piles Cut with Water Jets

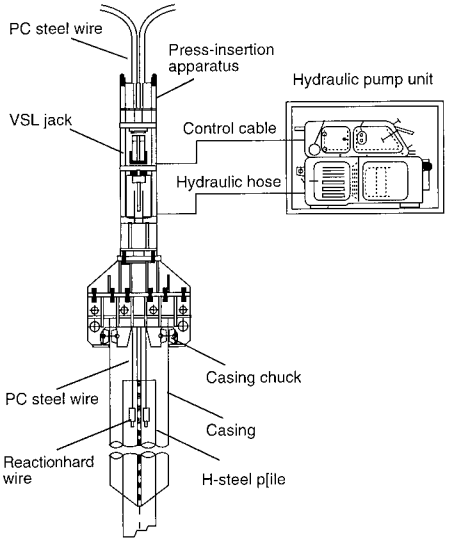
Taisei Corp. and Kako Co., Ltd. have jointly established a technique to cut and remove existing H-steel piles with water jets. Minimal vibration and noise are generated, so the technique can be applied even in congested residential regions. In fact, the technique was applied to the Miyakawa Bridge remodeling project carried out in Yokohama City. In this remodeling project, it was necessary to remove the existing H-steel bridge leg pillars, and these H-steel pillars were cut horizontally by the newly developed Underground Pile Cutting (UPC) technique.

In the work procedure, a cylindrical casing is press-inserted along two H grooves to a depth of about 2 m in the ground, the nozzle generating a jet water flow is lowered inside the casing, and the steel piles cut with the jet water flow through slits 10 mm wide provided on the casing, then the steel piles and casing are removed. In Yokohama, the piles were cut at a depth of 1.5 m. An abrasive was mixed into the water jets, and a pressure of 2,450 kg/cm^2 was used.

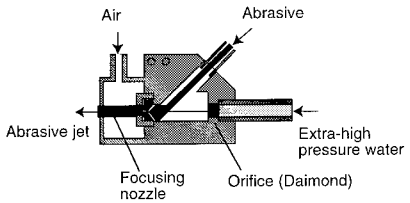
This new press-cutting technique consists of a spectacle casing, a casing press-insertion system and a cutting system. The spectable casing is a steel tube to set the cutting system to the prescribed depth along the H-steel piles. Two steel tubes are linked together with band steel into a single assembly, and 10-mm slits are opened beforehand at the cutting positions. Casing



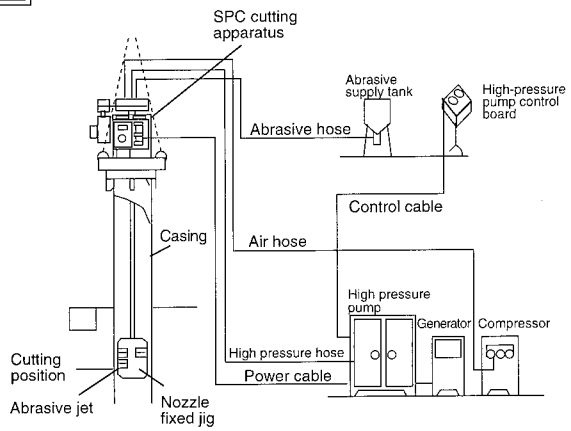
Pile cutting concept chart



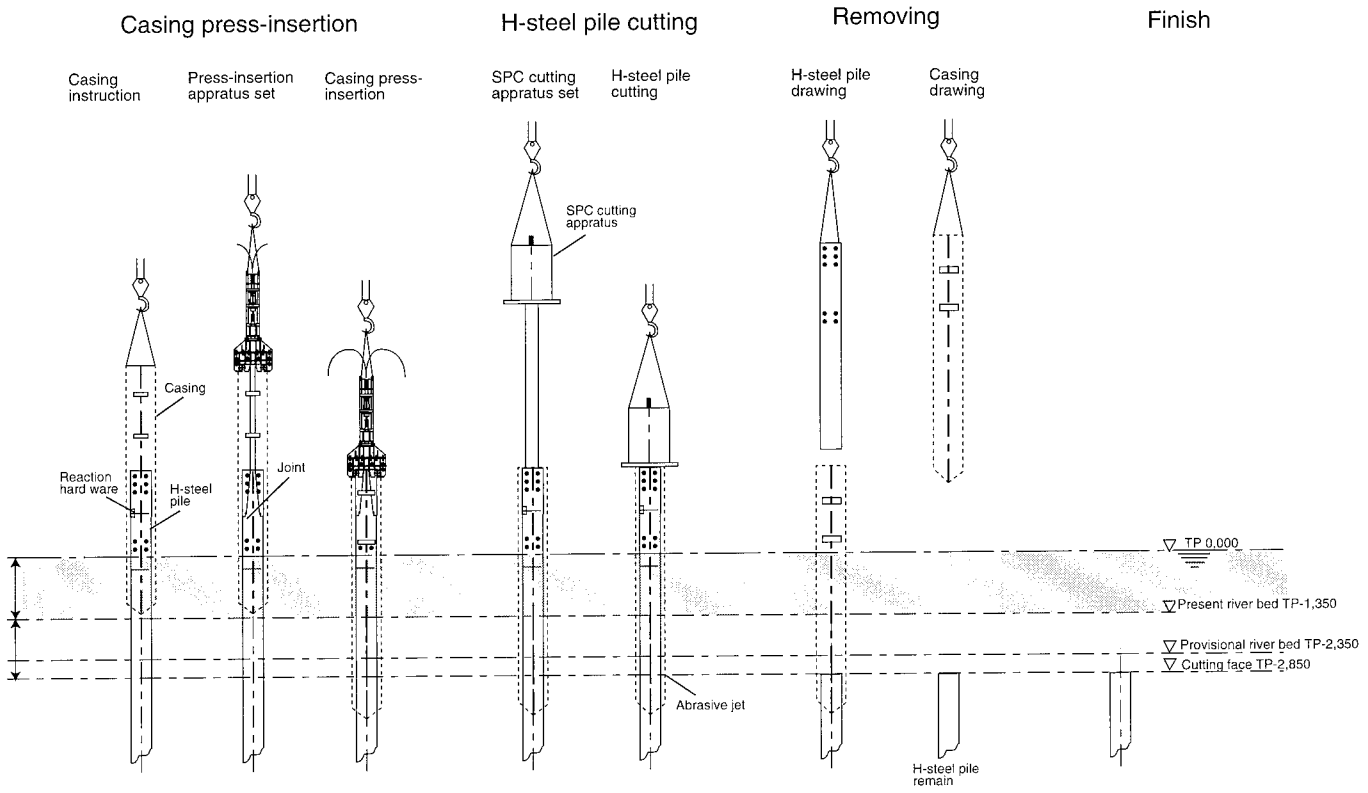
Casing press-insertion system chart



Nozzle cross section



Abrasive jet cutting system chart



Pile cutting work application flow chart

press-insertion is accomplished with a VSL press-insertion jack by utilizing the repulsion force generated by the H-steel piles to be cut.

The cutting system uses an abrasive jet (water pressure 2,450 kg/cm^2) that can set in a narrow space. The water jet is mixed with an abrasive (garnet), by which steel and concrete are cut rapidly. Both sides of the H-steel piles are cut one after another, and the cut piles and casing removed ultimately to complete the series of operations.

* ***Taisei Corporation***
Public Relations Dept.
1-25-1, Nishishinjuku, Shinjuku-ku Tokyo 163-0606
Tel: +81-3-5381-5011
Fax: +81-3-3345-1386

98-02-006-03 Inorganic Reactive Reforming Penetrant Prevents Concrete Surface Deterioration

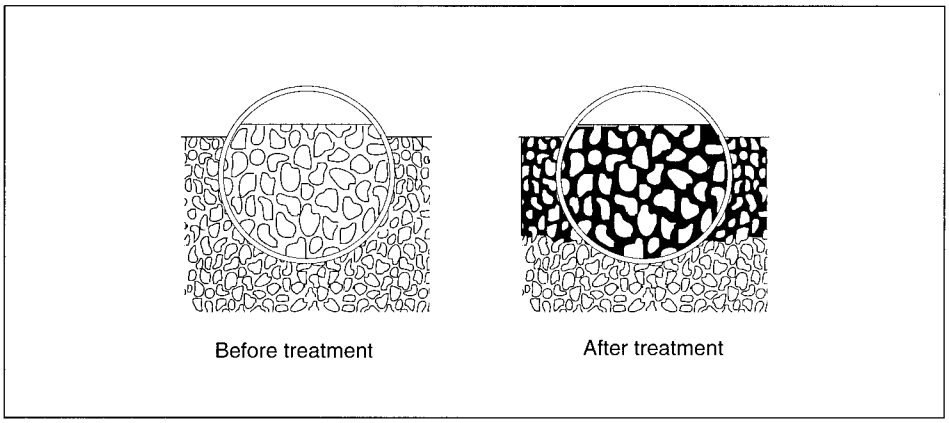
Nikko Co., Ltd. has established a technology to prevent deterioration of concrete structures by applying a liquid penetrant consisting primarily of silicon on the surfaces of concrete walls, and has started to accept orders to preserve concrete structures. The liquid reforming penetrant, when applied to concrete surfaces and dried naturally, is converted into a vitreous substance that hardens the concrete and prevents concrete structures from corrosion by the action of acid rain.

The penetrant is Crystal Sealer, an inorganic reactive reforming liquid agent developed by the company chairman T. Morimi. It is applied to the concrete wall with a brush, a roller or by spraying, and penetrates into the concrete to a depth of 5-20 mm where it reacts with the ions inside the concrete, undergoes a substitution reaction and forms an insoluble crystal (vitreous) substance. The penetrant is dried naturally in about 3 hrs and converted into a vitreous substance that prevents rainwater infiltration. The substance also features a wear resistance effect, and when used in parking lots, prevents tire damage and dirt adhesion.

Application example

Concrete is a convenient and comparatively inexpensive structural material and is used to fabricate structures of various shapes. However, air bubbles infiltrate into the concrete when mixing, which generates voids into which acid rain or sulfur dioxide gas in the atmosphere infiltrate and damage the concrete structure. Also, in winter, the infiltrated water content expands after freezing to cause cracks inside the concrete structures.

Applying Crystal Sealer converts the porous concrete substance into a non-porous substance that is highly resistant to deterioration by freezing, and its excellent waterproofing effect is retained over a long time. In particular, whereas acid rain causes the neutral deterioration of concrete, the non-reacting parts of Crystal Sealer enclose these neutral particles and generate insoluble substances, by which the effects of acid rain are considerably reduced.



Effect of Crystal Sealer

The alkaline components of concrete undergo constant erosion due to the actions of carbon dioxide in the atmosphere and other substances. The reforming layer formed through the reaction with Crystal Sealer prevents the infiltration of water, carbon dioxide and oxidizing gas which are the causes of the neutralization phenomenon, and regeneration by Crystal Sealer provides a strong alkaline property, and the weatherability of concrete is improved, deterioration by ultraviolet rays is suppressed, and the generation of mold is prevented. The concrete contains calcium silicate hardened by the reforming reaction as well as colloidal silicate, so the surface grains of the concrete are sealed, so that the concrete structure also has a good appearance.

The company requested the foundation Construction Materials Testing Center to compare the deterioration rates between concrete with an application of Crystal Sealer and non-treated concrete. Tests corroborated that non-treated concrete underwent deterioration to a depth that is nearly seven times compared with that of treated concrete, which shows the effect of the new reforming agent. The company plans to accept orders to preserve concrete structures at a cost of about ¥2,500/m^2.

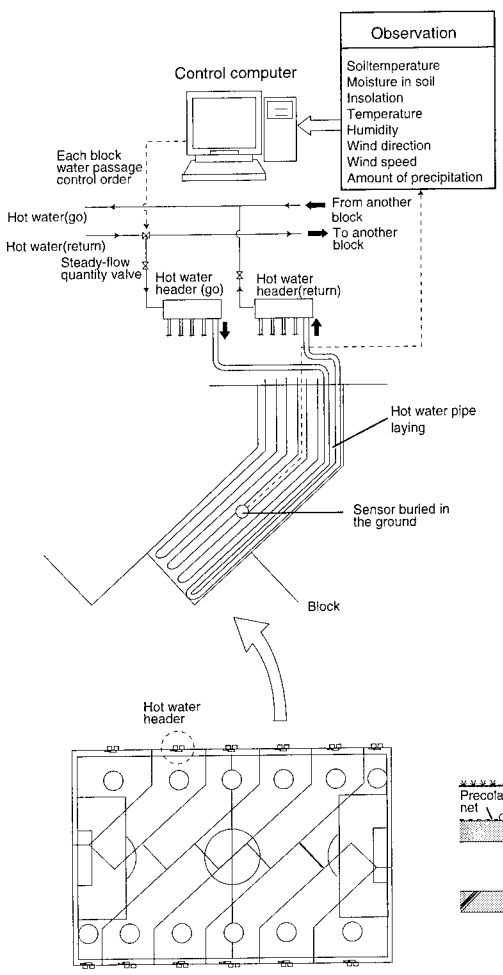
* ***Nikko Co., Ltd.***
Public Relations Dept.
4-32-3, Ogikubo, Suginami-ku, Tokyo 167-0051
Tel: +81-3-3393-7641
Fax: +81-3-3393-7632

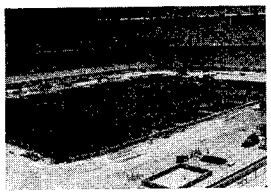
98-02-006-04 Soil Temperature Control System Maintains Athletic Grounds in Fresh Green State

Sato Kogyo Co., Ltd. has developed a system to control the soil temperature and constantly maintain the lawn grass of football fields, for example, in a fresh green state. Hot water is passed through pipes buried in the ground, and the water passage time and temperature are controlled automatically.

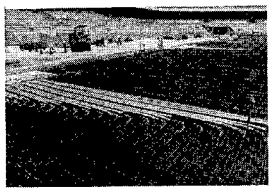
The soil temperature will differ with meteorological conditions such as the duration of insolation, the season, the time of the day, the temperature, the wind velocity and on whether it is sunny or rainy, as well as on the depth of the soil. In addition, the temperature does not correspond

Solcon system concept chart





Pipe laying for soil temperature control system



Pipe laying status

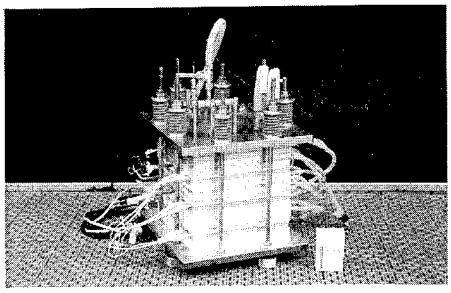
immediately with meteorological changes but with a time lag, while much time is required to raise the soil temperature by hot water passage, so soil temperature control is quite difficult.

With the company newly developed system Solcon, the soil temperature, insolation, as well as the meteorological conditions such as the weather and wind velocity, are sensed from instant to instant with sensors buried in the ground, by which temperature control is accomplished automatically to an optimum state to support lawn growth. The control is accomplished by FEM analysis and a unique control algorithm. The temperature and water passage time of the hot water pipes buried underground are controlled automatically to maintain the soil to a depth of 5 cm from the surface, that influences lawn growth, to an appropriate temperature. An athletic field consisting of about 8,000 m^2 of natural lawn is divided into 12 blocks and the temperature controlled for each block. This system is installed in the International Stadium Yokohama in December 1997.

In Europe, a system to warm the field is being adopted by over 20 football fields, but this is the first time that an automatic control system has been introduced that can be operated in conformance with meteorological conditions.

* ***Sato Kogyo Co., Ltd.***
Architectural Design Dept.
Tokyo MI Bldg. 2-4, Higashi-Shinagawa 2, Shinagawa-ku, Tokyo 140-002
Tel: +81-3-5462-3640
Fax: +81-3-5462-3701

Energy & Resources



Outlook of methanol reformer

98-02-007-01

Compact Methanol Reformer for Fuel Cells

Mitsubishi Electric Corp. has developed a compact methanol reformer for fuel cells. The reformer utilizes methanol to generate hydrogen which is the fuel for fuel cells. The size of the new reformer is only one-tenth of the conventional type. Carbon monoxide (CO) in the hydrogen gas, which deteriorates the performance of fuel cells significantly, is suppressed by this new design. The reformer will be commercialized by the year 2005 for use on electric automobiles.

The fuel cell that generates electricity through reacting hydrogen with oxygen features a high power generation efficiency, and since it discharges only a small volume of carbon dioxide (CO_2), is environmentally friendly. The new reformer supplies hydrogen to the solid polymer electrolyte fuel cells (PEFCs), and its commercialization is anticipated for application to electric automobiles and for use as a household power unit.

A flat laminated structure was devised to construct the reformer as four basic units in the form of flat reactors of the same size. This permits efficient lamination which realizes both a unified and compact assembly simultaneously. The new reformer is of 1-kW class, and consists of flat unit reactors having an effective reactive area of 14 cm x 15 cm and thickness of 5 mm. To improve the reformer heat transfer performance, the reactor assembly is supplied with corrugated thin plates which are filled with catalyst. This leads to a reformed hydrogen generation of 1-3 kW in power generation equivalent. The dimension of this new reformer are W290 mm x D290 mm x H260, mm which is about one-tenth the size of a conventional reformer. The reforming reaction generates CO in addition to hydrogen and carbon dioxide.

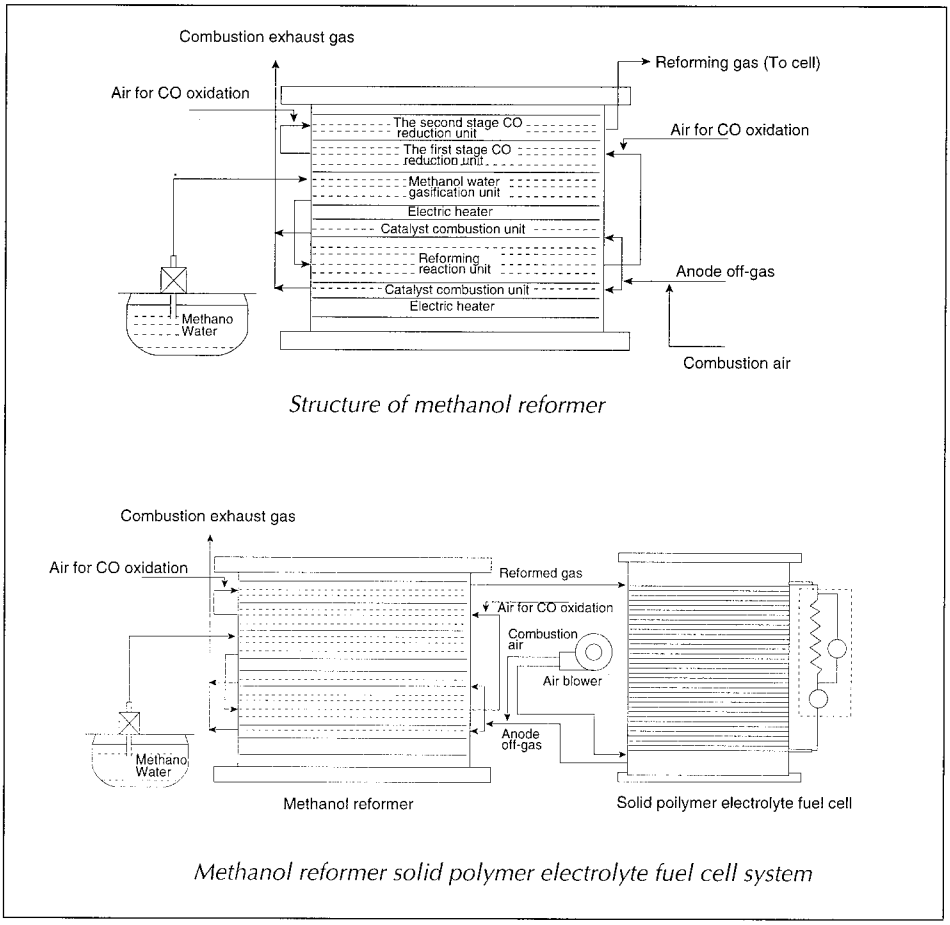
PEFCs operate at low temperatures, so the performance of the cell is deteriorated due to the influence of the electrode catalyst on the CO contained in the reformed gas. In order for the cell to achieve its full capacity, it will be necessary to maintain in CO concentration level in the reformer gas (which is typically about 100ppm) as low as possible.

The new system uses a platinum-based catalyst. The operating temperature was changed and the system was developed to selectively oxidize CO in two stages. Reformed gas containing about 1% (10,000 ppm) of CO is induced from the reformer reactive unit, and supplied to the CO reduction unit, in which a small volume of air for CO oxidation is supplied in the first stage to decrease the CO concentration to about 30-100 ppm while maintaining a comparatively high temperature (about 200 °C) to promote reaction. In the second stage, the temperature is lowered to about 100 °C in order to oxidize only the remaining CO without oxidizing the hydrogen. As a result, the CO concentration was lowered to a few ppm. A fuel cell is generally capable of generating power by utilizing hydrogen gas of 60-70% purity.

To recover and reutilize the residual hydrogen gas (anode off-gas), the catalyst combustion system was adopted for the reforming reaction heat supply unit. Also, the method of mixing the anode off-gas and combustion air inside the flat reactor unit was devised. By this method, complete combustion was attained even at low temperatures of about 350 °C and independent PEFC operation was realized.

Experiments were conducted using this reformer in combination with the solid polymer electrolyte fuel cell. The fuel cell displayed a power generation performance of 1.15 kW .

* ***Mitsubishi Electric Corporation***
Public Relations Dept.
2-2-3, Marunouchi, Chiyoda-ku, Tokyo 100-0005
Tel: +81-3-3218-2171
Fax: +81-3-3218-2431
E-mail : nagataj@prd.hon.melco.co.jp



98-02-007-02

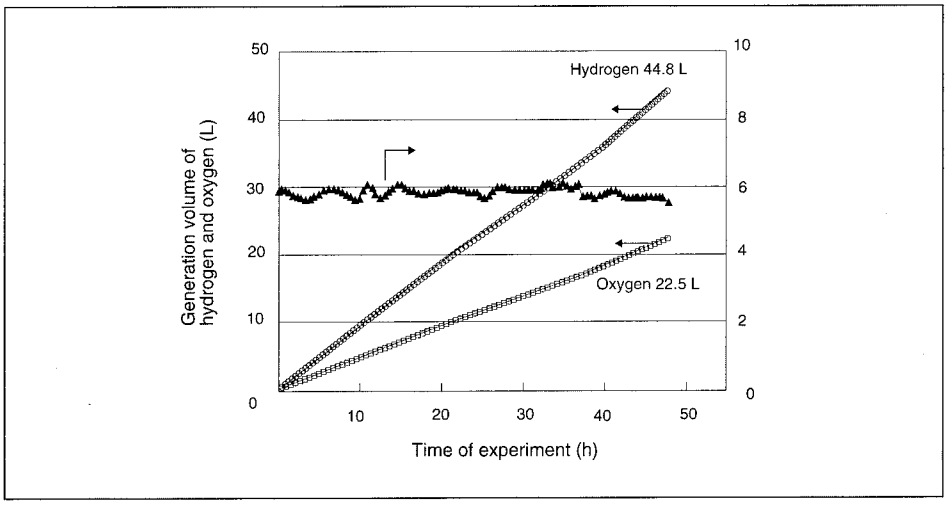
Hydrogen Production by High-Temperature Water Decomposition

The Japan Atomic Energy Research Institute has succeeded in producing hydrogen continuously by decomposing water with thermal energy at high temperature. More specifically, hydrogen is produced by decomposing water thermochemically by a thermochemical Iodine Sulfur (IS) Process. Water is decomposed by reacting with sulfur oxide and iodine at a high temperature of up to about 1,000 °C.

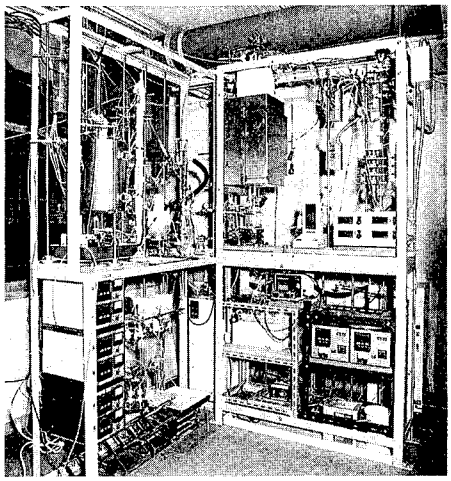
Hydrogen was produced continuously at a rate of about 0.9 l/hr over a period as long as 48 hrs with stability for the first time. High-temperature nuclear heat generated with a high-temperature gas reactor may be used to manufacture clean hydrogen from water by the thermochemical IS process in the future.

The process uses a combination of three reactions: the Bunsen reaction forming hydriodic acid and sulfuric acid from iodine and sulfur dioxide (using iodine in excess to separate a sulfuric acid solution of low specific density and polyhydriodic acid (HIx) solution of high density, the reaction of thermal decomposition of hydriodic acid to generate hydrogen, and the reaction of thermal decomposition of sulfuric acid and generation of oxygen. The compounds, sulfur dioxide and iodine, are used repeatedly as the circulating materials in a closed cycle, so no harmful substance is discharged outside.

The research institute acquired all necessary basic data relating to the three reactions, data relating to the separation and equilibrium of the intermediate substances



Result of experiment of producing hydrogen continuously by the IS Process



Experiment apparatus for producing hydrogen continuously by the IS Process

hydriodic acid and sulfuric acid, established the conditions for material balance necessary for the closed cycle, devised a new type of pump suitable for transferring the iodine solution into the Bunsen reaction, and a method of monitoring and correcting the closed cycle (to cope with changes in the material balance).

In the continuous 48-hr experiments which were conducted, 44.8 l of hydrogen and 22.5 l of oxygen were generated. The iodine concentration in sulfuric acid solution was maintained within the range of ±4% of the initial concentration, so the stability of the process was fully confirmed.

* ***Japan Atomic Energy Research Institute***
Dept. of Advanced Nuclear Heat Technology
3607, Niibori, Narita-cho, Oarai-machi, Higashi-Ibaraki-gun, Ibaraki Pref.
311-1394
Tel: +81-29-282-6177
Fax: +81-29-282-5790

Environment

98-02-008-01

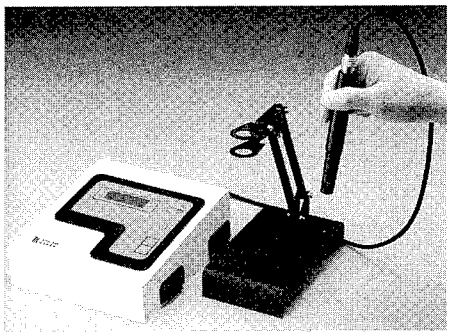
Ozone Water Density Monitor

Tokyo Kaken Co., Ltd., has started marketing an ozone water density monitor OZM-01D. The new monitor introduces a newly developed moving electrode, so is much more compact and lightweight than conventional types of monitoring systems, and operated with ease without requiring any reagent.

Several methods are available for ozone water density analysis, such as the ultraviolet ray absorption method, the diaphragm method, the KI method, the coloration method and detection tube method, but all these methods lack the characteristics necessary for decisive analysis.

The ultraviolet ray absorption method is expensive (about ¥1 million), its mechanism complicated, and much time and labor is required for maintenance due to the use of magnetic valves. The diaphragm method uses a diaphragm and electrolyte which have to be replaced regularly, and the measurement range is rather limited. The KI method using the electrochemical quantity method requires the use of a chemical and the measurement requires several minutes, so is unsuitable for making ozone water density measurements which are characterized by very short half life. The coloring method has a narrow measurement range and color discrimination each time is cumbersome, while the detection tube method requires the use of glass detection tubes and several hours are required for making measurements.

The monitor developed to overcome these various disadvantages is the realtime ozone water density monitor OZM-01D. This measurement method, in contrast to the polarograph method, is an electrical analysis method in which the ozone water density is measured by the electromotive force generated through reaction, without having to impress a voltage between electrodes, and is otherwise known as the Galvani method.



Ozone water density monitor OZM-01D

The sensor is placed in the ozone water, and the ozone water density displayed digitally in real time instantaneously simply by depressing the measurement pushbutton. It is compact with a size of 180 × 50 × 200 mm, and has a low running cost. It is also lightweight, or weighs only 1 kg, and can be carried about with ease. The monitor has a measurement range of 0-15 ppm, and is marketed at a domestic price of ¥550,000.

* ***Tokyo Kaken Co., Ltd.***
Public Relations Dept.
3-20-9, Yushima, Bunkyo-ku, Tokyo 113-0034
Tel: +81-3-5688-7402
Fax: +81-3-3831-8960

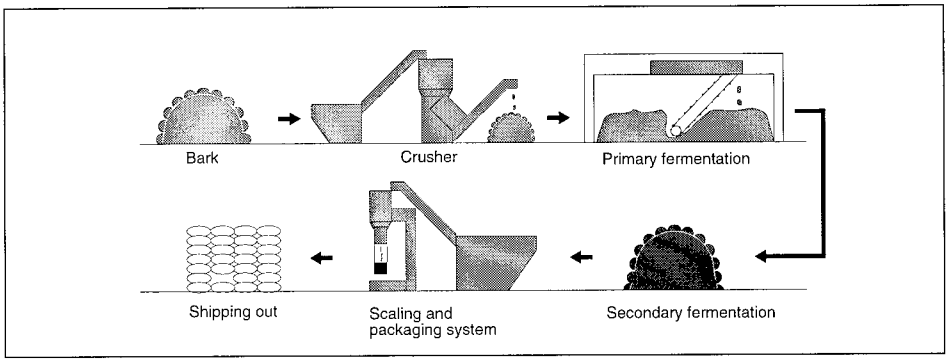
98-02-008-02

System for Fermentation of Timber Bark into Compost

Shibuya Machinery Co., Ltd., a subsidiary of Shibuya Kogyo Co., Ltd. has developed a system to ferment industrial waste timber bark generated at lumber mills and to convert the bark into compost.

The system is available in several models with daily treatment capacities from 10 m^3 to 50 m^3, and is sold at a domestic price from ¥50 million to ¥200 million.

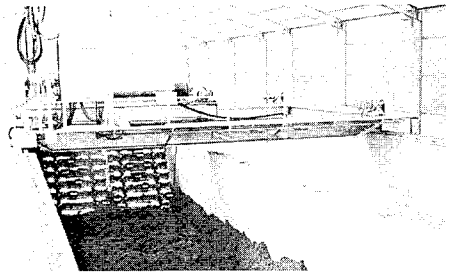
* ***Shibuya Kogyo Co., Ltd.***
International Operations
Mameda-Honmachi, Kanazawa City,
Ishikawa Pref. 920-0047
Tel: +81-76-262-1200
Fax: +81-76-223-1795



System flow chart

The waste bark peeled off from raw timber at lumber mills is crushed and fermented, but the fermentation speed is normally rather slow. The new processing system consists of the processes of bark crushing, fermentation and systems for scaling and packaging, and the treatment facility. The bark is crushed with the crusher, then undergoes primary fermentation treatment. The primary fermentation treatment is followed by the secondary fermentation treatment, and the finished compost is scaled and packaged with the scaling and packaging systems, then shipped out.

The upper part of the treatment facility is equipped with a self-running stirring system, and the crushed bark fed into the fermentation bin is stirred while passing auxiliary air into the bin with air pipes equipped at the bottom of the bin to accelerate fermentation. The compost is marketed through the sales channels of various agricultural cooperatives.



System to ferment industrial waste timber bark

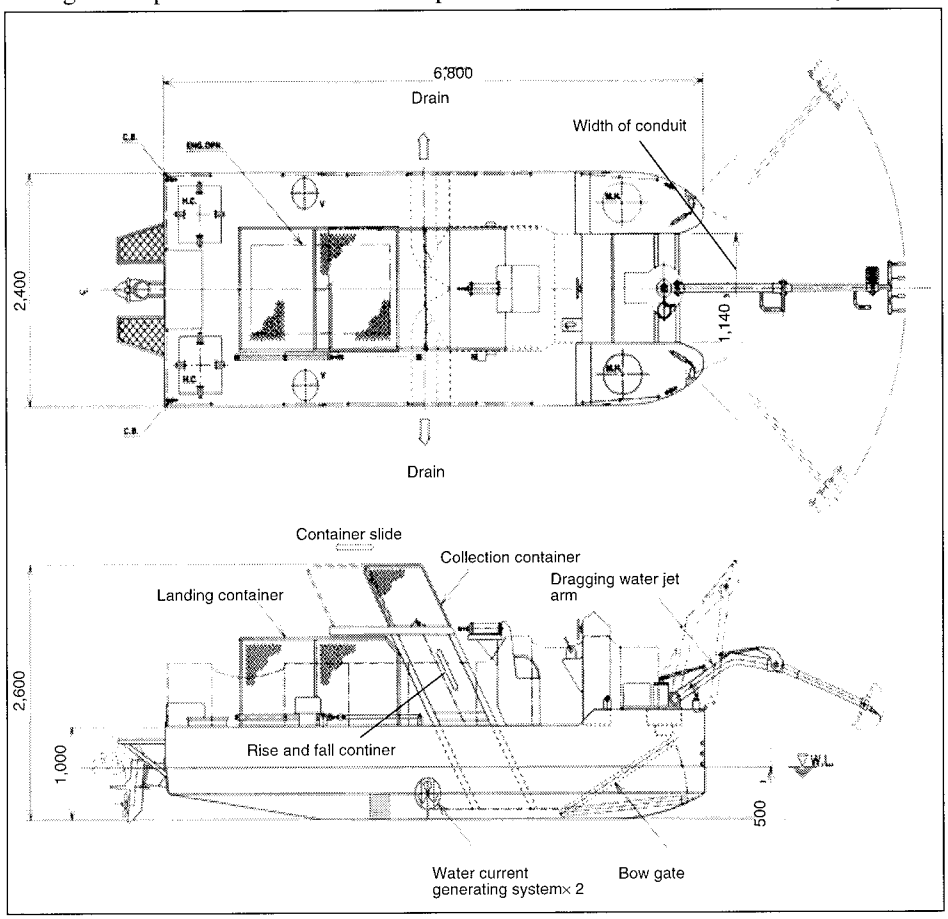
98-02-008-03

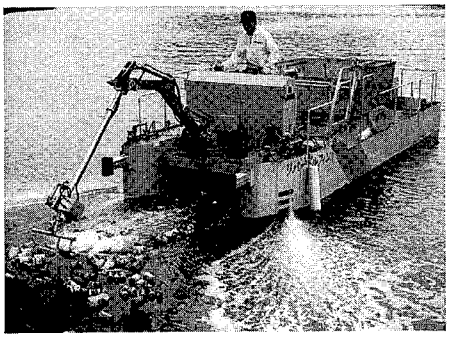
Compact Refuse Collection Boat Carries on Land

Kyowa Kiko Co., Ltd. has started marketing a compact refuse collection ship River Dolphin to collects refuse from river banks and shallow coastline regions. Due to its compactness, the ship can enter shallow waters impossible for conventional types of refuse collection vessels, and recover refuse most efficiently. It is sold at a domestic price of under ¥ 20 million.

River Dolphin can be transported on land with ease to inland regions such as mountains as well as dams, rivers and lakes. It has an overall length of 6.8 m, breadth of 2.4 m, depth of 1 m, draft of 0.5 m and speed of 7 knots. It can be run by a single operator with a Class 4 permit for compact vessels.

The ship consists of a water current generating system, an extendable dragging water jet arm, a wing nozzle, a bow gate and a refuse collection container with a capacity of 2 m^3. A jet current is generated at the ship front part and the refuse dragged in for collection into the ship. In addition to its compactness, the ship features great safety, high cleaning, and availability at a relatively low price. It is expected to permit substantial labor saving in refuse collection in ports, harbors, rivers and lakes where the waves are not so rough.





River Dolphin

* ***Kyowa Kikoh Co., Ltd.***
2-7, Okishin-cho, Sasebo City, Nagasaki Pref. 857-1171
Tel: +81-956-34-1311
Fax: +81-956-31-7562
Homepage: http://village. inforweb. ne. jp/~kywk/
E-mail: kywk@mb.infoweb.ne.jp

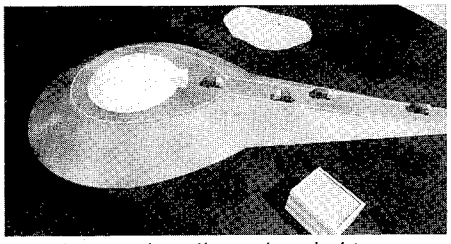
98-02-008-04

Construction of Totally Enclosed Ultimate Waste Treatment Concrete Dome

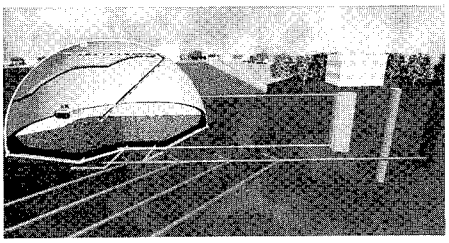
Fujita Corp. has established a technology to construct a totally enclosed ultimate waste treatment dome (HP dome) that is produced by jetting quality concrete onto frames made of pneumatic membranes.

The dome has a semispherical shape, and since there are no supporting structural members on the sides and in the ceiling, a larger volume of wastes can be stored. At present, domes with a maximum diameter of 60 m can be constructed. The dome side and bottom parts are completely made of duplex water-shielding construction to prevent external effusion of water from the wastes which may contain toxic substances such as dioxin.

Wastes are fed into the dome with a dumping mechanism installed at the inlet, or a belt conveyor system may be used. Inside the dome, the wastes are levelled out uniformly, while a heavy-duty machine is used for waste compression, and little noise is heard outside since the dome is totally enclosed. The working environment inside the dome is ventilated to preserve worker health, and dust as well as offensive odors are not leaked outside due to the use of a special type of filtration system. In addition, there is no rain water seepage into the dome, so there is no need to use a water seepage treatment facility, and the construction and maintenance costs are suppressed.



Aerial view of totally enclosed ultimate waste treatment dome

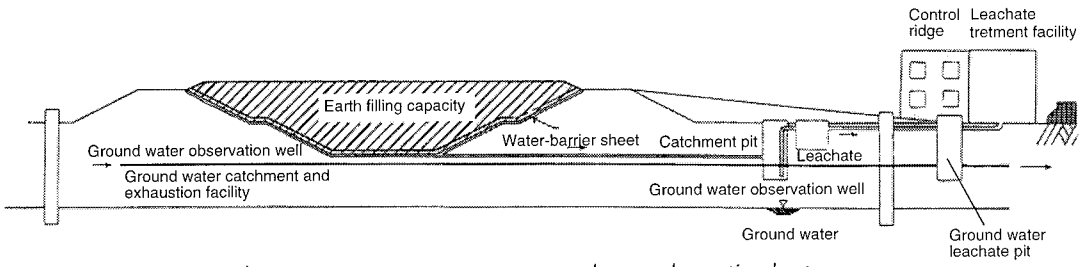


Cross section chart of totally enclosed ultimate waste treatment dome

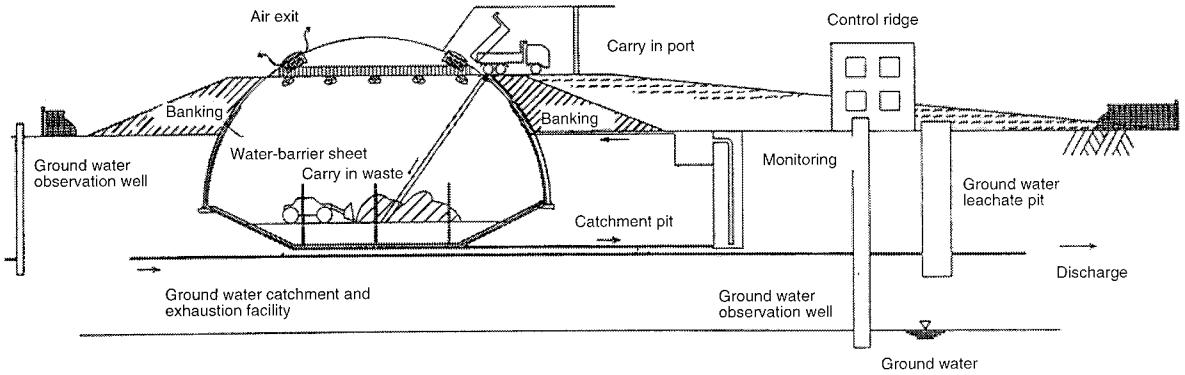
Compared with conventional methods for constructing ultimate waste treatment facilities, the new technology enables the construction schedule to be halved and the construction cost to be reduced by 20-30%.

* ***Fujita Corporation***
Public Relations Dept.
4-6-15, Sendagaya, Shibuya-ku, Tokyo 151-8570
Tel: +81-3402-1911
Fax: +81-3796-2346

Conventional type administration type ultimate waste treatment facility schematic diagram



Ultimate waste treatment concrete dome schematic chart



Biotechnology & Medical Science

98-1-009-01
Collagen Apatite Extracted from Fish Scales

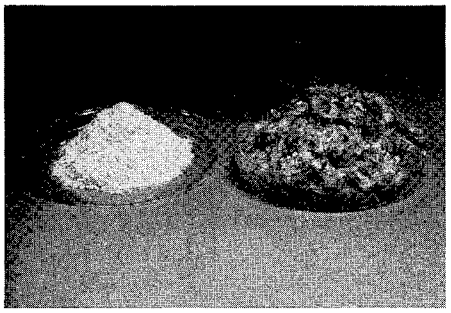
Shida Canning Co., Ltd. has succeeded in extracting collagen and apatite from fish scales which are normally thrown away, and has already commercialized the first tablet and canned food containing both collagen and apatite.

These products are produced as health foods by processing fish scales into pulverized form and extracting hydroxyapatite consisting of collagen which are present in fish scales. The manufacturing process consists of fish scale collection, removal of foreign substances, washing, sterilization, drying, pulverization and tableting/canning.

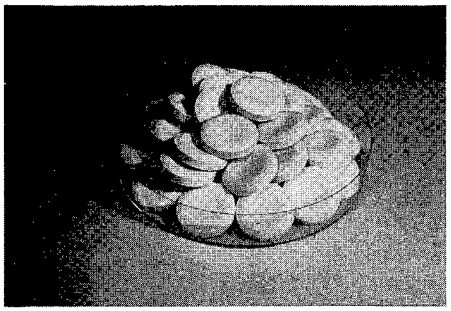
The tablet type Collagetite has the same flavor as yogurt and each tablet (1,500 mg) contains 190 mg of collagen, 100 mg of calcium and 54 mg of phosphorus. A case containing 12 tablets is sold at a domestic price of ¥450 and the sales point is its high cost-performance compared with foods containing only collagen or apatite. These raw materials are also added to canned mackerel and sold at a retail price of ¥200/can. Experiment results have corroborated that milch cows, horses and pigs fed with Collagetite are less tired in summer, mastitis (mammary lacteal gland inflammation) is prevented, the conception rate improved in artificial fertilization, hair growth and heartbeat improved, and irritation eliminated.

The collagen contained in the raw material is a protein that comprises the main substance of the skin, and promotes skin health. Apatite is an inorganic substance that comprises about 65% of human bones and teeth, so these substances are applied to clinical and teeth brushing agents.

The waste water generated during fish unloading consists largely of organic substances such as fish blood, visceral effusions and scales, so there is a great probability of the waste water becoming a source of environmental pollution over the short-term or long-term unless treated properly. Scales are estimated to make up 2% of the body of sardine and mackerel pike, so the scale generated at fish unloading totals a staggering volume and is an issue that has to be resolved. In this respect, the manufacture of Collagetite has the double effect of utilizing fish scale that was treated as waste and of conversion into a useful product.



Collagetite (powder and fish scales)



Collagetite tablet type

* ***Shida Canning Co., Ltd.***
Public Relations Dept.
2-1, Sangen-cho, Cyoshi City, Chiba Pref.
288-0045
Tel: +81-479-22- 7555~7
Fax: +81-479-22-3538

98-02-009-02
Ultrahigh-Speed Decoding of Gene Base Sequences

Mitsubishi Chemical Corp. Tsukuba Research Laboratory is developing a new technology to decode gene base sequences at ultrahigh speed. This technology can decode gene base sequences in units of blocks, and the decoding work that used to require over a full day can now be accomplished in 20-30 min. The gene base sequence decoding technology is necessary for developing new medical drugs as well as for the diagnosis of genes relating to diseases, but existing decoding techniques require too much time, so new high-speed techniques are under research in various countries.

This technology is based on a chip on which multiple base sequences of deoxyribonucleic acid (DNA) are attached in checkered mesh form, and mixed with the DNA to be decoded inside a test tube. Observing which type of substance adsorbs the DNA on the chip shows what complementary sequences are contained in the DNA. The substance with which the DNA is bonded is confirmed with a charge-coupled device (CCD) camera, and the result analyzed with a computer to deduce the base sequence.

With the sequencing by hybridization (SBH) method, appropriate hybridization conditions are set and only a completely complementary oligo DNA probe is hybridized selectively with respect to the target DNA, and the specifically hybridized oligo DNA probe data is analyzed to determine the base sequence of the target DNA. The key of the SBH method is the establishment of hybridization conditions to rigidly discriminate hybrids which are completely matched or mismatched with the target DNA. The research team applied the stacking probe method for a universal base that hybridizes neutrally with respect to ATGC bases (method of hybridization using a probe in which universal bases are attached on both terminals of a specific base), by which mismatching discrimination and hybridization sensitivity are both improved. In addition, studies were advanced on the designing of stacking probe DNA by mixing various types of universal bases, and confirmed that the discrimination of mismatching terminal hybrids can be improved further.

This project was advanced as a part of the Innovative Technology for the Earth R&D Program that is supported by the New Energy and Industrial Technology Development Organization (NEDO).

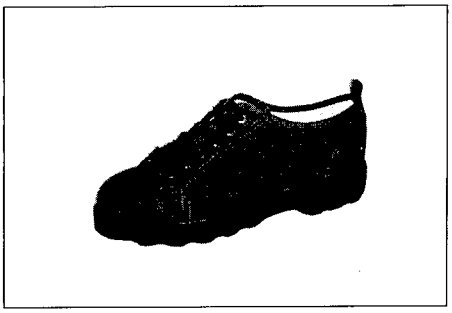
* ***Mitsubishi Chemical Corporation***
Business Affairs Group
8-3-1, Chuo, Amicho, Inashiki-gun,
Ibaraki, Pref. 300-0700
Tel: +81-298-87-1013
Fax: +81-298-87-6925

FLASH

Waste Polyethylene Bottles Recycled into Fiber for Producing Shoes

ASAHI Corp. has established technology to recycle waste polyethylene (PET) bottles into fiber to produce a new brand of shoes with the instep and side of the entire uppers made of the recycled fiber. A manufacturing license has been acquired to produce the shoes using recycled fiber under the name brand Unsetu Native. The new technology responds to the growing sense of consumer environmental preservation awareness, and represents an appeal to enterprises to engage seriously in environmental preservation.

Waste PET bottles are cut into fine chips to produce a cottonlike raw material in twisted yarn form. The processed PET material is used to produce the upper materials and lining materials of shoes. Fiber equivalent to a pair of adult shoes is obtained from about one-half of a 1.5-liter PET bottle. In the sector of garments, regenerated products such as T-shirts are increasing, but few shoes made from recycled materials are produced, excepting for a few manufacturers who are producing sports shoes.



SBU1509

Four models of sneakers (ten types including those of different colors) for use by either male or female adults as well as those for children were marketed in December at domestic prices of ¥2,300-2,800. In February, the plan is to market four models (20 different types) of casual shoes for women (price: ¥4,900-5,900).

* ***Asahi Corporation***
Public Relations Dept.
2-10-10, Taihei, Sumida-ku, Tokyo 130-0012
Tel: +81-3-5610-1295
Fax: +81-3-5610-1290

Aerosol Type Incombustible Polyurethane Foam

TOKYO Aerosol Chemical Co., Ltd. has developed and started marketing an aerosol type incombustible polyurethane foam called Incombustible TAC Foam FR-20. This is the first convenient aerosol type polyurethane foam of Class 3 incombustibility in Japan and is usable as a heat insulating material for repairing building parts as well as limited spaces where large machines cannot be used. The foaming material is marketed in two types of liquids, with a set of containers selling for ¥5,900.

When coating a heat insulating polyurethane foam at construction sites, there is the hazard of fire caused by a separate welding team, so the use of incombustible polyurethane foams is the prevailing trend. The new aerosol type foam is incombustible, and only its surface is charred without spreading the fire even if inadvertently ignited, and not much smoke is generated.

With a two-liquid aerosol type TAC foam, isocyanate (liquid A) and polyol (liquid B) are used in a 1:1 mixture and jetted out at a low pressure. In this case, a viscosity difference in these two liquids will make it difficult to jet these liquids out in mist form. An isocyanurate compound (isocyanate group trimer) of excellent incombustibility, or macromolecular polyol (100% polyester polyol) can be used, but the viscosity difference makes the foam brittle.

To resolve this difficult viscosity problem, the company selected an MDI-based isocyanate of high molecular weight as a measure to meet the low-pressure condition of about 5 kg/cm^2 to clear the legal requirements, and adjusted the viscosity difference between liquids A and B to a minimum level by using an isocyanurate compound (special type of metal-based catalyst) in combination with a polyurethane compound (amine-based catalyst). As a result of this ingenious scheme, the new polyurethane foam hardening time was shortened to 60-180 s, and led to the commercialization of the highly stabilized Incombustible TAC Foam FR-20.

TAC Foam FR-20

The accelerated-humidification ASTMD-2126 test (heat and moisture withstand test at 70 °C and relative humidity (RH) of 95%/24 hrs) corroborated that the new foaming material dimensional change is less than 5.0%, and heat and flame resistance tests also confirmed adequate resistance to welding fire balls to prevent exposure. The foaming material also features a cold resistance of -30 °C/24 hrs, a dimensional change of less than 1.0%, and the self-adhesion property is not inferior compared with conventional types of foaming materials.

* ***Tokyo Aerosol Chemical Co., Ltd.***
Public Relations Dept.
1-25-9, Minami-Ikebukuro, Toshima-ku, Tokyo 171-0022
Tel: +81-3-3984-1401
Fax: +81-3-3984-1713

JETRO

Japan External Trade Organization

Machinery and Technology Department